Recovery Plan for the Threatened Nelson's Checker-mallow

(Sidalcea nelsoniana)

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Date: 9/30/98

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EXECUTIVE SUMMARY

Current Status: Nelson's checker-mallow (*Sidalcea nelsoniana* Piper) is a federally listed threatened plant species with 64 extant occurrences distributed throughout the Willamette Valley and northern Coast Range of Oregon. Two outlying occurrences are known from the Puget Trough in adjacent southwest Washington.

Habitat Requirements and Limiting Factors: In the Willamette Valley, Nelson's checker-mallow populations typically occur in or along the margins of seasonally moist, grassy valley bottoms. Coast Range Nelson's checker-mallow populations occupy mountain meadows ranging from 1,600 feet to 1,960 feet (490 to 600 meters) in elevation.

Throughout its range, Nelson's checker-mallow habitat is threatened by encroaching successional species, primarily resulting from suppression or elimination of natural disturbance regimes including periodic flooding and fires. The overall degree of threat is relatively low in the Coast Range, while populations in the Willamette Valley are extremely imperiled. Agricultural and urban development have modified and depleted habitats, fragmenting populations into mostly small, widely scattered patches. In the Willamette Valley, extirpation is an ongoing threat to many Nelson's checker-mallow occurrences on private lands, roadsides, undeveloped lots zoned for industrial and residential development, and otherwise vulnerable sites. In addition to land use threats, Willamette Valley populations are particularly subject to competitive exclusion by exotic species, seed predation by weevils prior to seed dispersal, small population sizes, genetic isolation, and lack of variation within the local populations.

Recovery Objective: Delisting.

Recovery Criteria: Nelson's checker-mallow will be considered for delisting when the plant is permanently secured and managed in at least 2 reserves in each of 9 hydrological subbasins within the plant's range, for a total of 18 or more reserves. Each reserve must have at least 0.05 hectare (500 square meters or 0.12 acres) occupied by Nelson's checker-mallow, and each subbasin must have at least 0.3 hectares (0.74 acres) of habitat occupied by the plant, so that a minimum of 2.7 hectares (6.66 acres) is occupied by Nelson's checker-mallow plants as measured by methods described in the plan (by scoring square-meter plots as occupied or unoccupied). Area measurements are used because this plant appears to spread vegetatively, making it misleading to try to count individuals.

Until future research suggests otherwise, reserve populations will only be counted if they meet the following criteria (a) a minimum of 0.05 hectare (0.12 acres) of habitat occupied by Nelson's checker-mallow plants, (b) on average for any three consecutive years, there are reproductive plants in at least 30 percent of the occupied habitat, (c)

there is evidence of seedling establishment and survival, and (d) the reserve population is stable or increasing, as measured over a 10-year period.

Actions Needed:

1. Preserve and manage at least 18 Nelson's checker-mallow reserves
2. Establish long-term, ex situ banking of Nelson's checker-mallow seeds
3. Conduct studies on factors that threaten recovery of the species
4. Ensure effective outreach to landowners

Total Cost of Recovery($1,000):

Year	Need 1	Need 2	Need 3	Need 4	Total
FY1	49	19.62	66	5	139.62
FY2	528	7.62	94	5	697.62
FY3	430.5	7.62	94	5	537.12
FY4	373.5	7.62	30	5	416.25
FY5	373.5	7.62	2	5	388.25
FY6	373.5			5	378.5
FY7	373.5			5	378.5
FY8	373.5			5	378.5
FY9	373.5			5	378.5
FY10	373.5			5	378.5
FY11	373.5			5	378.5
FY12	373.5			5	378.5
FY13	313.5			5	318.5
Total	**4,682.5**	**50.12**	**284**	**65**	**5,081.62**

Estimated Date of Recovery: 2010

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INTRODUCTION

Nelson's checker-mallow (*Sidalcea nelsoniana* Piper) was listed on February 12, 1993 (58 FR 8242), as a threatened plant species under the authority of the Endangered Species Act of 1973, as amended (Act). It is also listed as threatened by the State of Oregon (OAR 603-73-070). The U.S. Fish and Wildlife Service (Service) is responsible for preparing a recovery plan and guiding actions that will restore populations and remove threats, such that the species no longer requires protection under the Act and can be removed from the List of Endangered and Threatened Plants. This recovery plan describes recovery goals and discusses how they may be achieved so that Nelson's checker-mallow can be removed from the list of threatened plants.

Notes on definitions: The term "population" is used throughout this recovery plan to describe a group of plants at a distinct geographic location. It is frequently used interchangeably with the terms "site" and "occurrence," and is not intended to necessarily designate biological populations *per se* (i.e., a defined group of interbreeding plants among which genetic exchange is sufficient to offset divergence due to natural selection or genetic drift).

The term "public land" is used to indicate all lands owned or leased, or for which an easement is held, by the U.S. government or the State of Oregon (and all political subdivisions thereof, as defined in OAR 603-73-002[16]).

Description of Species

Nelson's checker-mallow is an herbaceous perennial plant species in the mallow family (Malvaceae). The plant produces numerous elongate, upright inflorescences 5 to 15 decimeters (1.6 to 5 feet) tall, consisting of a vertical stem with 30 to 100

lavender to deep pink flowers on very short stalks. Like many of the members of this genus, Nelson's checker-mallow has a breeding system whereby mature plants produce either exclusively female flowers or "perfect" flowers with both male and female parts (a gynodioecious breeding system). Although the two types of plants exhibit no perceptible vegetative differences, female flowers are generally smaller than perfect flowers and bear only vestigial, non-functional anthers (the sacs containing pollen) at the ends of the stamens. The stamens are typical of the mallow family in being fused at the base to form a tube around the style. The plant's basal leaves are palmately lobed, upper stem leaves are deeply divided, and stems are variably covered with simple hairs. Fruits consisting of a ring of 7 to 9 single-seeded, lightly reticulate, beaked segments (like segments of an orange) separate at maturity. Plants produce short, thick, twisted underground stems, as well as a system of fine roots extending from a stout taproot. For further descriptive information see Hitchcock (1957), Peck (1961), and Halse *et al.* (1989).

Four other native *Sidalcea* species are found within Nelson's checker-mallow's geographic range: *S. virgata* Howell is typically shorter and begins flowering earlier than the other checker-mallows in the region, tends to occupy somewhat dryer, more upland sites, and has forked/branched stem hairs and distinctively deep pink to rose-colored flowers; *S. campestris* Greene is the tallest checker-mallow in the region, and can be distinguished by its large, pale pink to white flowers; *S. cusickii* Piper occurs only within the extreme southern portion of Nelson's checker-mallow's range, barely extending north of the city of Eugene, Oregon, and is discernable by generally forked stem hairs, broad calyx lobes, and prominently veined petals; *S. hirtipes* C.L. Hitchcock has a longer and fuzzier calyx, longer petals, and longer hair on the stem. Its range overlaps that of Nelson's checker-mallow in the Coast Range and Lewis County, Washington. *S. hirtipes* is itself considered endangered in Washington by the Natural Heritage Program.

Distribution

Nelson's checker-mallow occurs as scattered populations in two distinct ecological regions — the northern Coast Range and the Willamette Valley of Oregon (Figure 1). Two outlying populations are located in the Puget Trough of Washington (directly north of the Willamette Valley), but are grouped with Willamette Valley populations based upon similarities in their valley bottom habitats.

The Willamette Valley is a broad, gently north-sloping, alluvial floodplain separating the Coast Range to the west from the Cascade Range to the east. Willamette Valley Nelson's checker-mallow sites range in elevation from 44-200 meters (145-650 feet). Willamette Valley Nelson's checker-mallow sites occur within a mosaic of urban and agricultural areas, with primary concentrations around the cities of Corvallis and Salem, located in Benton and Marion counties, respectively. There are 51 extant Willamette Valley occurrences distributed in Oregon's Benton, Linn, Marion, Polk, and Yamhill counties, and two extant Puget Trough occurrences in Lewis and Cowlitz counties in Washington. At least 50 percent (28) of the occurrences within the Willamette Valley occur on public lands with 4 of the occurrences being located on both public and private property. Currently, 39 percent (18) of the occurrences are totally in private ownership.

The Oregon Coast Range is a north-south oriented mountain range with a general crest line altitude of about 460 meters (1,500 feet), occasionally exceeded by higher peaks (Baldwin 1981). Nelson's checker-mallow populations range in elevation from 490-600 meters (1,600 – 1,960 feet). Coast Range Nelson's checker-mallow populations primarily occupy open, grassy meadows within a larger matrix of coniferous forest. There are 11 extant Nelson's checker-mallow sites in the Coast Range, distributed in Oregon's Yamhill, Washington, and Tillamook counties. Currently 45 percent (5) of these occurrences are in private ownership. The

remainder of the occurrences in the Coast Range are on property belonging to the City of McMinnville. Part of Walker Flat is on public lands, some of them owned by the City of McMinnville and the rest by the Federal government, managed by the Bureau of Land Management (BLM).

Appendix I provides a labeled reference map and list of all known extant Nelson's checker-mallow sites. The sites have been grouped into nine recovery zones to ensue that the plant is conserved throughout its range and to ensure that recovery measures are appropriate to the different areas where the plants occur (in particular, separating the plant's distribution in the Coast Range from the Willamette Valley). The recovery zones correspond to hydrologic subbasins, and are referred to as "subbasins" in the remainder of this plan. These hydrologic subbasins are the Wilson-Trask-Nestucca, upper Willamette, middle Willamette, south Santiam, Molalla-Pudding, Yamhill, Tualatin, lower Columbia-Clatskanine, and upper Chehalis. The subbasins are discussed below in the Recovery section.

Life History and Demography

In the Willamette Valley, Nelson's checker-mallow begins flowering as early as mid-May, and continues through August to early September, depending upon the moisture and climatic conditions of each site. Coast Range populations experience a shorter growing season and generally flower later and go dormant (senesce) earlier (58 FR 8243). Nelson's checker-mallow inflorescences are indeterminate, and often simultaneously exhibit fruits, open flowers, and unopened buds. Seeds are deposited locally at or near the base of the parent plant and may be shed immediately or persist into winter within the dry flower parts that remain attached to the dead stems. Seed dissemination could conceivably be accomplished through ingestion by deer and elk, particularly in the Coast Range, although this phenomenon has not been documented.

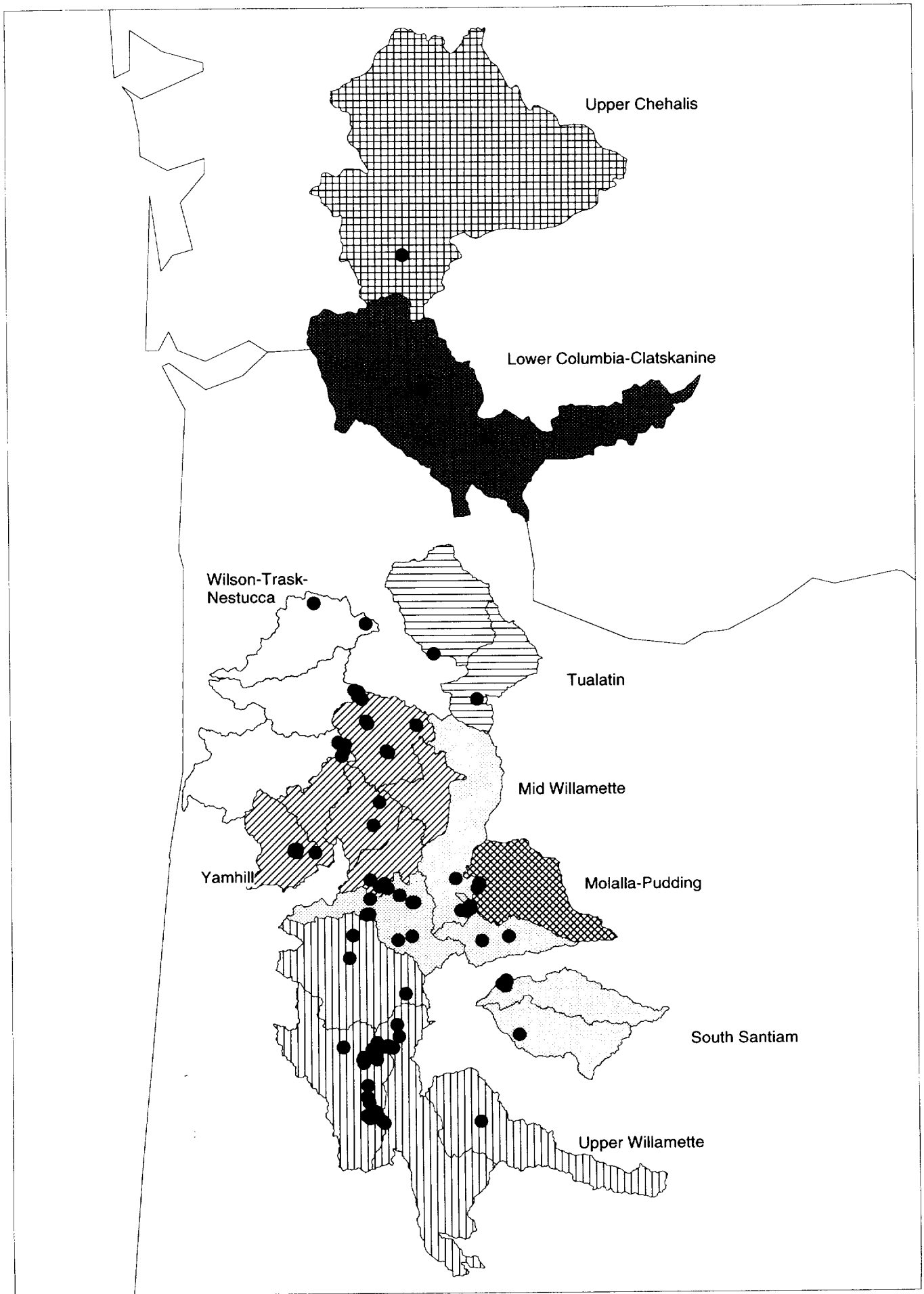

Figure 1. Distribution of known extant Nelson's checker-mallow occurrences (represented by dots), grouped into 9 subbasins.

Above-ground portions of the plant die back in the fall, usually followed by some degree of regreening at the base, characterized by the emergence of small, new leaves that persist through the winter directly above the root crown. It is not uncommon for some plants to continue producing some flowers into the fall and early winter, although this is usually limited to one or two small stems per plant, with little consequent seed production (Steve Gisler, Oregon State University, pers. comm., 1997). Sexual reproduction in Nelson's checker-mallow appears to be accomplished entirely by insect pollinators (Robert Meinke, Oregon State University, pers. comm., 1997). Self pollination by pollen from the same flower is prevented because the pollen of Nelson's checker-mallow matures before the stigma (pollen-receiving surface of the female part of the flower) is ready to accept pollen (Hitchcock 1957). However, there is evidence that pollen from other flowers on the same inflorescence or from adjacent ramets of the same genet[1] can fertilize the ovule to make a seed (S. Gisler pers. comm., 1997). Sexual reproductive output in the species is limited by a number of factors, including flower and fruit abortion, intermittent floral production, lack of ovule and seed development, herbivory of inflorescences by ungulates, floral herbivory by butterfly larvae, and seed predation by weevils prior to dispersal. There is some experimental evidence that Nelson's checker-mallow is capable of hybridizing with other local members of the genus (R. Meinke, pers. comm., 1997). It is not yet known to what extent hybridization naturally occurs, if resulting seeds

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[1] In plants that spread vegetatively, stems appearing above-ground may be genetically identical representatives (ramets) of a single genotype (genet) — i.e., parts of a single clone. A genet is a genetically-distinct individual, while a ramet functions as an individual in terms of occupying space and competing with neighboring plants. Because there is evidence that Nelson's checker-mallow spreads via rhizomes, this plan avoids referring to ramets as "individuals" and its provisions for monitoring checker-mallow reflect the apparent impossibility of identifying or counting genets (and of determining population sizes from a genetic point of view). Rather than counting plants, the plan emphasizes measuring how much area is occupied by checker-mallow plants. The plan relies on sampling populations by using square 1 meter × 1 meter plots, which are scored as occupied or unoccupied by the checker-mallow.

and/or progeny are viable or fertile, what the progeny might look like, or what significance hybridization may have on the species and its taxonomy.

Nelson's checker-mallow seeds germinate readily under laboratory conditions after scarification of the seed coat (CH2M Hill 1986). One study of seed germination in nature yielded germination rates of one percent after one year, and 15 percent after two years (CH2M Hill 1991), suggesting that seeds may not only remain viable in a soil seed bank over a period of years, but may also require prolonged exposure to suitable environmental conditions to adequately soften seed coats and promote germination. Despite the observed germinability of Nelson's checker-mallow seeds under controlled conditions, the paucity of seedlings and homogeneous population structures observed among most Willamette Valley populations suggest that actual seedling recruitment and establishment may be very low (Oregon Department of Agriculture [ODA] 1995). Seedlings have been more frequently observed in Coast Range populations, perhaps due to higher seed yields, lower levels of pre- and post-dispersal seed mortality, and/or other environmental conditions more favorable to seed germination. Further research is needed to assess the potential vulnerability of the seedling stage in the life history of Nelson's checker-mallow, especially in Willamette Valley habitats.

There are reports that Nelson's checker-mallow spreads vegetatively, via spreading rhizomes, although actual subterranean connections between ramets have not been documented. However, successful propagation of Nelson's checker-mallow clones utilizing rhizome fragments (CH2M Hill 1986-1996) suggests the potential for this species to spread vegetatively. Further research is needed to determine the extent of natural clonal spread in Nelson's checker-mallow populations, and assess its potential consequences for intra-population genetic diversity.

Habitat and Ecology

Nelson's checker-mallow is not specific to a single habitat type. The species occupies a broad range of soils, varying in texture, drainage, and disturbance regimes (CH2M Hill 1986). Nelson's checker-mallow is not found exclusively in gravelly, well-drained soils or exclusively in wetlands (CH2M Hill 1986). However, CH2M Hill (1986) reports that Nelson's checker-mallow typically occurs in primary drainages (i.e., areas receiving mostly ground flow of storm water runoff, as opposed to drainages fed by stream sources). The character of these habitats differs between the Willamette Valley and Coast Range distribution of the species.

Although occasionally occurring in the understory of woodlands or among woody shrubs, Willamette Valley Nelson's checker-mallow populations usually occupy open habitats supporting early seral plant species[2]. These habitats are frequently represented by margins of sloughs, ditches, and streams, roadsides, fence rows, drainage swales, native prairie remnants, and fallow fields. Most sites have been densely colonized by invasive weeds, especially introduced forage grasses. Some of the plant taxa commonly associated with Nelson's checker-mallow in the Willamette Valley include: tall fescue (*Festuca arundinacea*), Rose (*Rosa* spp.), common rush (*Juncus effusus)*, Canada thistle (*Cirsium arvense*), common St. John's-wort (*Hypericum perforatum*), blackberry (*Rubus* spp.), sedge (*Carex* spp.), Timothy (*Phleum pratense)*, velvet grass (*Holcus lanatus*), yarrow (*Achillea millefolium*), vetch (*Vicia spp.*), Western spiraea (*Spirea douglasii*), bird's-foot trefoil (*Lotus corniculatus)*, ox-eyed daisy (*Chrysanthemum leucanthemum*), colonial bent-grass (*Agrostis tenuis*), meadow foxtail (*Alopecurus pratensis*), reed canary-grass (*Phalaris arundinacea*), Douglas' hawthorn (*Crataegus douglasii*), wild carrot (*Daucus*

[2] i.e., plants that colonize openings, disappearing as trees shade them out.

carota), large-leaved avens (*Geum macrophyllum*), geranium (*Geranium* spp.), and Oregon ash (*Fraxinus latifolia*) (ODA 1995).

Coast Range Nelson's checker-mallow populations typically occur in open, wet to dry meadows, intermittent stream channels, and along margins of coniferous forests. These areas generally support higher components of native vegetation than Willamette Valley sites. Plant taxa commonly associated with Nelson's checker-mallow in the Coast Range include: tansy ragwort (*Senecio jacobaea*), spear-head senecio (*S. triangularis*), strawberry (*Fragaria virginiana*), velvet grass, timothy, rush (*Juncus* spp.), sedge, and yarrow.

A number of animal species are associated with Nelson's checker-mallow. Stems and inflorescences are commonly eaten by deer and elk. Nelson's checker-mallow occurs in a horse pasture at one site, although grazing by horses does not appear to be a problem at this time or under current management at that site. Nelson's checker-mallow is not known to occur in pastures actively utilized by cattle, and grazing by cattle has been observed among plants growing along pasture fence rows (S. Gisler, pers. comm., 1997). Nelson's checker-mallow flowers are visited by a diverse assemblage of insects, including leafcutter bees (Megachilidae), honey bees (Apidae), bumble bees (Bombidae), hover flies (Syrphidae), butterflies (Hesperiidae), and pollen-foraging beetles (Cerambycidae and Meloidae). The species is also a host for various phytophagous insects such as aphids (Aphididae), stinkbugs (Pentatomidae), scentless plant bugs (Rhopalidae), spotted cucumber beetles (Chrysomelidae), plant bugs (Miridae), milkweed bugs (Lygaeidae), spittlebugs (Cercopidae), butterfly larvae (Lycaenidae: *Strymon melinus*; Nymphalidae: *Vanessa anabella*), and in the Willamette Valley, weevils (Curculionidae: *Macrohoptus sidalcae*). Other insects found in association with Nelson's checker-mallow include ants (Formicidae) and earwigs (Forficulidae). Crab spiders (Thomisidae) have been frequently observed hunting for insect prey among Nelson's checker-mallow flowers, while garden spiders

(Araneidae subf. Argiopinae: *Argiope aurantia*) occasionally utilize stems and leaves as web anchors (BLM 1985; CH2M Hill 1986; ODA 1995).

Reasons for Listing

Land use and habitat loss. There is no direct evidence of Nelson's checker-mallow's abundance prior to European settlement. However, the small, scattered remnants of undeveloped land in the Willamette Valley, along with herbarium records and the species' affinity for prairie-like habitats, suggest that Nelson's checker-mallow historically occurred more extensively throughout native grasslands of the Willamette Valley. It is unknown if Nelson's checker-mallow historically occurred in the Coast Range or, as some have suggested, was more recently introduced into the mountain meadows via livestock feed originating in the Willamette Valley (CH2M Hill 1986).

Prior to European settlement, Nelson's checker-mallow habitats were likely maintained and kept free of overgrowth and woody vegetation by natural wildfires, fires set by Native Americans (Johannessen *et al.* 1971; Franklin and Dyrness 1973; Boyd 1986), and sporadic flooding. The landscape and processes such as flooding and fire have been dramatically altered since the onset of European settlement. Today, no natural prairie remains in the Willamette Valley without evidence of livestock grazing, agricultural, and fire suppression (Moir and Mika 1972). Urbanization and conversion of the native prairies into intensively managed croplands and pastures have eliminated and fragmented grasslands to the extent that Nelson's checker-mallow is now restricted to sparsely distributed patches within narrow highway and county road right-of-ways, undeveloped tracts, ditches, fence rows, abandoned fields, parks, and wildlife refuges.

Although numerous Willamette Valley Nelson's checker-mallow occurrences are on public lands, some of the eight roadside populations continue to be subject to

inadvertent disturbance from roadside maintenance, herbicide application and mowing, soil cultivation, ditching, and other habitat modifications. The most serious threats related to management and land use, however, are faced by the 29 populations on private lands, which are not subject to state and federal laws governing listed plant species. A decade of population observations has documented the ongoing disturbance or complete extirpation of populations on private land due to non-industrial timber harvest operations, urbanization, herbicide application, agricultural activities, and other land-use practices (CH2M Hill 1986-1996). These Willamette Valley populations can be expected to face increasing threats in the future as land use intensifies, and many, if not all, may be extirpated if habitat protection and management is not assured.

Land use threats are less extreme in the Coast Range, where the meadows occupied by Nelson's checker-mallow are isolated from agricultural and urban development. Currently, the only foreseeable significant land use threat in the Coast Range is to a single population, located at Walker Flat in Yamhill County, that occurs within the projected inundation zone of a water impoundment project planned for nearby Walker Creek. Timber harvest activities conducted adjacent to meadows occupied by Nelson's checker-mallow may benefit populations by creating temporarily open areas for population expansion. However, harvested areas are often sprayed with herbicides just prior to reforestation and, thus, spray may drift into occupied Nelson's checker-mallow areas. Furthermore, the habitat of several Coast Range populations is disturbed by recreational use by motorcyclists.

Competitive exclusion and habitat modification by exotic species. In addition to threats directly resulting from human disturbance, Nelson's checker-mallow is also limited by a number of extrinsic and intrinsic biological factors. Competition with invasive, alien plant species, which predominate at most Willamette Valley Nelson's checker-mallow sites, may be a serious limiting factor for the plant. Mature,

established Nelson's checker-mallow plants may have high competitive abilities as suggested by their frequent occurrence with the highly competitive Canada thistle and other weeds (CH2M Hill 1986). However, Nelson's checker-mallow seedlings and young plants, which lack the vigorous, established root systems and energy reserves needed to compete with alien plants for resources, may fare poorly. In such situations, population recruitment may be restricted and population viability compromised. Nelson's checker-mallow seedlings have reduced vigor when growing among competing species (CH2M Hill 1987), a problem likely worsened by the abundance of tall fescue, an alien grass with allelopathic[3] effects on other species (Burchick 1993). Competitive exclusion may explain the observed rarity of seedlings and young plants, and predominance of apparently older established plants, in most Willamette Valley populations (ODA 1995).

The impacts of alien species may extend beyond simple competitive exclusion of Nelson's checker-mallow. Recent studies indicate that seed germination and seedling establishment in numerous Willamette Valley prairie plant species are greatly inhibited by thatch accumulations from alien grasses (Maret 1997). Most Willamette Valley Nelson's checker-mallow sites have abundant perennial alien grasses and thick layers of thatch that have accumulated due to years of fire suppression. That may explain, in part, the low number of seedlings produced at these sites.

Competitive exclusion and habitat modification by alien plants not only threaten existing Nelson's checker-mallow populations, but may also inhibit population expansion and colonization. Despite some evidence that Nelson's checker-mallow has either persisted in, or perhaps historically colonized, disturbed habitats (CH2M Hill 1986), it appears that the species may currently have a limited ability to invade new, seemingly suitable habitats. This problem is apparent throughout the Willamette

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[3] Allelopathy is the inhibition of plant growth or seed germination by substances emitted by other plants.

Valley, where many populations exist as small, isolated patches of established plants, with little evidence of recent colonization or expansion into surrounding available habitat. Competition with invasive alien plants may contribute to the lack of population expansion. To persist, Nelson's checker-mallow must colonize unoccupied areas at least as fast as existing populations become extirpated.

Nelson's checker-mallow populations in the Coast Range appear less threatened by competitive exclusion by alien plants. Although some alien species have invaded the mountain meadows where Nelson's checker-mallow occurs, native plants are still well represented and the habitats are less fragmented and their composition more stable.

Succession. Nelson's checker-mallow typically occupies open habitats, and declines when trees and shrubs encroach. Shaded Nelson's checker-mallow plants have weak, elongated stems when compared to plants growing in the open (CH2M Hill 1986). Although Nelson's checker-mallow is responding positively to release from encroaching vegetation at several sites (CH2M Hill 1989; U.S. Fish and Wildlife Service 1993), encroachment continues to adversely affect the species at least half of the populations throughout the Willamette Valley (U.S. Fish and Wildlife Service 1993).

Encroachment occurs in both Willamette Valley and Coast Range habitats, but appears to be most problematic in the former, where invading woody plant species (e.g., Oregon ash, Oregon oak [*Quercus garryana*], blackberry, rose, hawthorn, and western spiraea) are more pervasive, and where natural processes that maintain early successional conditions are rare or excluded. Coast Range meadows may to some degree be maintained in early seral stages by herbivory of tree and shrub seedlings by elk and deer (which are less common in Willamette Valley habitats), occasional flood events, and forest fires (as evidenced by the presence of burned tree remains within

meadow clearings). Encroachment of Nelson's checker-mallow habitat will continue unless natural disturbance or human intervention maintain optimal, open conditions.

Reproductive limitations. Nelson's checker-mallow is also threatened by limited seed production. Causes of limited seed production include flower and fruit abortion, intermittent flower production, plant and inflorescence herbivory, limited seed development, seed loss due to seed predation by weevils, and an excess of female flowers. Predation-caused seed mortality rates frequently exceed 85 percent among Willamette Valley Nelson's checker-mallow populations (S. Gisler, pers. comm., 1997). High levels of seed predation over consecutive growing seasons could adversely impact population recruitment and may result in depletion of soil seed banks, which may represent important demographic and genetic reserves that buffer established plant populations against local catastrophe. High levels of seed predation have been identified as a potential limiting factor in several rare Oregon taxa (R. Meinke, pers. comm., 1997), and a primary threat to numerous rare plant species throughout North America (Louda 1983; Hegazy and Eesa 1991; Boyd and Sarafini 1992; Pavlik *et al.* 1993; Windus and Snow 1993). Variation in number of plants flowering from year to year appears greater in Coast Range populations, perhaps due to environmental conditions. Strongly female-biased population structures and seed predation by weevils are primarily restricted to Willamette Valley populations.

Small population size and fragmentation. Small populations are more prone to loss of variation due to genetic drift, and are more likely than large ones to suffer reduced fitness and accumulation of deleterious mutations through inbreeding depression (Barrett and Kohn 1991; Lande 1995). It is believed that small populations generally lack the genetic variability necessary to respond to random environmental changes, and may thereby be more susceptible to pressures from pests and diseases (Hamilton 1982; Beardmore 1983). The problems associated with small populations may be exacerbated in many Nelson's checker-mallow populations (particularly those in the

Willamette Valley) by limited gene exchange due to habitat fragmentation, as well as a preponderance of female-flowered plants.

Nearly 50 percent of Nelson's checker-mallow occurrences contain 100 or fewer plants, and 16 contain fewer than 25 plants (i.e., ramets) (CH2M Hill 1996). There apparently are only 5 populations containing more than 1,000 plants; two of these occur in the Willamette Valley and three are located in the Coast Range. Further research will be necessary to define functional population boundaries, and determine population sizes.

Current Conservation Measures

Many conservation measures have already been undertaken for Nelson's checker-mallow, including regulatory measures, extensive range-wide inventories for the species, research, and habitat management.

Regulatory Measures. Nelson's checker-mallow was listed as a threatened species by the Service in 1993, under the authority of the Endangered Species Act of 1973, as amended (U.S. Fish and Wildlife Service 1993). This Federal designation requires all Federal agencies to actively pursue efforts to conserve listed species (section 7) and ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or modify its critical habitat. The Endangered Species Act also regulates interstate and foreign trade in Nelson's checker-mallow.

Nelson's checker-mallow is also regulated under Oregon's State Endangered Species Act, where it is listed as a threatened species (OAR 603-73-070). Regulations under state law are similar to those under the Federal Endangered Species Act, requiring all state agencies to ensure that activities they authorize, fund, or carry out on state-

owned or state-leased land are not likely to adversely affect any state-listed species. State laws also regulate commercial trade in Nelson's checker-mallow within Oregon.

Inventory. Extensive, range-wide inventories have been conducted for Nelson's checker-mallow, and have resulted in many new discoveries and relocations of historic occurrences (BLM 1985; CH2M Hill 1986-1996; ODA 1995). This work has improved our understanding of Nelson's checker-mallow's range, current distribution, abundance, and habitat preferences.

Research. The following research projects have recently been, or are being, conducted to increase our knowledge about Nelson's checker-mallow:

- Habitat analysis — ODA, CH2M Hill/McMinnville Water and Light (MWL), and BLM-Salem District.
- Habitat management evaluation — Finley National Wildlife Refuge.
- Taxonomic studies — ODA and CH2M Hill/MWL
- Germination, propagation, transplantation, field establishment — CH2M Hill/MWL
- Seed production and predispersal seed predation — ODA
- Hybridization and reproductive biology — ODA, in progress
- Population observation/monitoring — BLM and CH2M Hill/MWL

Management. Management for Nelson's checker-mallow is occurring at numerous locations, through the efforts of Federal, state, tribal, and municipal entities. Under special agreements with the Service, the City of Hillsboro and the Confederated Tribes of the Grand Ronde have each relocated Nelson's checker-mallow plants to avoid destruction by changes in land use. The City of McMinnville (Water and Light Department) has developed a seedling establishment and rhizome transplant program under agreement with the Service and the BLM. The Oregon Department of Transportation (ODOT) has developed a signing program to delineate and protect Nelson's checker-mallow populations along state highways, and has transplanted

individual plants to avoid disturbance from road construction. The Salem Municipal Airport is developing a conservation agreement with the Service to monitor and manage populations on airport property.

Recovery Strategy

Nelson's checker-mallow will be conserved by establishing a network of protected natural habitats (reserves), distributed evenly throughout the plant's native range. To ensure even distribution, the plan requires reserves in each of the 9 hydrologic subbasins within which the plant occurs. Hydrologic subbasins were selected to guide reserve distribution because they are natural units of the landscape, less arbitrary than political units, such as county boundaries. The plan suggests several ways to set aside reserves in private and public ownerships.

For a reserve to be counted toward the recovery objective, it must have enough checker-mallow plants, as measured over a number of years. Because the plants spread via underground stems, it is not practical to count "individuals" in the genetic sense. The plan suggests an efficient method of measuring whether habitat is occupied by the checker-mallow by laying out square-meter plots and scoring each as occupied or unoccupied. Because checker-mallow populations in the Coast Range are expected to be less stable than those in the Willamette Valley, different standards are applied to populations in the two areas.

Reserves will need management, including measures to control encroaching plants, such as trees, and to reduce effects of competing grasses. Populations of Nelson's checker-mallow may need to be augmented, so seed banking is needed as a first step.

Finally, carefully directed studies will be conducted to ensure the effectiveness of reserve management.

RECOVERY

Objective

The ultimate objective of the recovery plan, through implementation of the recovery actions and tasks is to remove threats to Nelson's checker-mallow to the point where it is no longer in danger of becoming endangered, and is believed capable of sustaining itself indefinitely within its historic range.

Criteria for delisting. Nelson's checker-mallow will be considered for delisting when:

- At least 0.3 hectares (0.74 acres) of habitat are occupied[4] by Nelson's checker-mallow plants for each of the following eight hydrological subbasins: Coast Range — Wilson-Trask-Nestucca (17100203); Willamette Valley — Upper Willamette (17090003), Middle Willamette (17090007), south Santiam (17090006), Molalla-Pudding (17090009), Yamhill (17090008), Tualatin (17080010); and Puget Trough — Lower Columbia-Clatskanine (17080003) and upper Chehalis (17100103).
- Additionally, (a) the 0.3 hectare or more of occupied habitat in each subbasin must be in at least 2 reserves, preferably in different watersheds of the subbasin. Each reserve must have at least 0.05 hectares (0.12 acres) of habitat occupied by Nelson's checker-mallow plants. The Wilson-Trask-Nestucca subbasin, the only one in the Coast Range, would greatly benefit from a third reserve, although this is not absolutely essential. (b) Each reserve is secure from the threats identified in the Reasons for Listing (p.10). (c) On average for any 3 consecutive years, at least 30 percent of the occupied habitat in each reserve has reproductive plants, (d) there is evidence of seedling establishment and survival, and (e) the reserve population has been stable or increasing for a period of 10 years.

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[4] "Occupied habitat" is defined based on a vegetation sampling procedure using 1 meter × 1 meter plots that are scored for the presence or absence of Nelson's checker-mallow. A plot with one or more checker-mallow stem is considered a square meter of "occupied habitat." The proportion of these plots occupied by Nelson's checker-mallow at a given site is the plant's "frequency."

The total size of a reserve will be considerably larger than its area of occupied habitat. If the frequency of Nelson's checker-mallow in suitable habitat is about 30 percent, for example, the reserve recovery goal of at least 0.5 hectare (0.12 acres) of occupied habitat would require a total of 1.5 hectares of suitable habitat, plus additional habitat to maintain the ecosystem, including pollinators and other biological requirements of the species.

In the Coast Range, studies at Walker Creek (in the Wilson-Trask-Nestucca subbasin) indicate that the frequency of Nelson's checker-mallow is 36 percent (i.e., 36 percent of meter-square plots are occupied) (Guerrant 1997). Extrapolating from this result, if other sites in the subbasin have Nelson's checker-mallow at roughly the same frequency, then the subbasin recovery objective of 0.3 hectare of occupied habitat would be met if the minimum of 2 reserves collectively contained about 1 hectare (10,000 square meters or 2.47 acres) of suitable habitat. In the Willamette Valley, the frequency of Nelson's checker-mallow was only 14 percent at the Salem Airport (A. Robinson, U.S. Fish and Wildlife Service, Portland, pers. comm., 1998). Each subbasin in the Valley may require at least 3 hectares (7.41 acres) of suitable habitat to meet its recovery goal.

Based upon the above frequency data for Nelson's checker-mallow, showing higher frequencies in the Coast Range, a different definition of a stable population is necessary for the Coast Range than for the Valley and Puget Trough. For the Coast Range, a stable population is defined for purposes of this recovery plan as one whose absolute drop in occupied habitat[5] is less than 33 percent during the ten-year period as determined by a monitoring program. For the Willamette Valley and Puget Trough reserves, a stable population is defined for purposes of this recovery plan as one

[5] If the checker mallow occupies 500 square meters, a 33 percent drop would leave 335 square meters occupied by the plant.

whose occupied habitat drops by less than 22 percent during the ten year period as determined by a monitoring program.

Two reserves per subbasin will assure that a single stochastic[6] event will not destroy all of the subbasin's plants. Furthermore, the minimum of two reserves will have a better opportunity to capture any differences in population variance that may occur across the subbasin especially if they are in different watersheds of the subbasin. Future studies (see Recovery Action 2) will verify the population sizes needed for recovery. Future demographic studies will also verify population age structures indicative of long-term stability or growth, there-by identifying the population structure of a stable reserve populations. If this research indicates the need for changes in recovery objectives for the reserve population to maintain stability, the recovery objective will be revised accordingly.

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[6] stochastic: random. In effect, events causing mass mortality or destruction of populations.

Stepdown Outline of Recovery Actions and Tasks

1. Preserve and manage at least 18 reserves
    - 1.1 Evaluate the status of all extant populations
    - 1.2 Select reserve sites
    - 1.3 Delineate reserve boundaries
    - 1.4 Protect reserves
    - 1.5 Evaluate reserve population status
        - 1.51 Conduct population monitoring
        - 1.52 Conduct demographic monitoring
    - 1.6 Manage reserves in Willamette Valley and Puget Trough
        - 1.61 Reduce succession and competition threat
        - 1.62 Reduce seed predation threat
        - 1.63 Augment populations
            - 1.631 Procure seeds
            - 1.632 Establish plants
    - 1.7 Manage reserves in Coast Range
        - 1.71 Reduce succession and competition threat
        - 1.72 Reduce impacts from off highway vehicles (OHV)
        - 1.73 Augment populations
            - 1.731 Procure seeds
            - 1.732 Establish plants
2. Ex situ banking of seeds
    - 2.1 Rank populations
    - 2.2 Collect and bank seeds
3. Conduct studies on factors that threaten recovery of the species
    - 3.1 Evaluate population fragmentation and gene flow
    - 3.2 Evaluate inter-population genetic variability
    - 3.3 Evaluate population self-sustainability
    - 3.4 Evaluate ways to reduce threats of competition by exotics
    - 3.5 Evaluate efficacy of habitat management strategies
    - 3.6 Evaluate efficacy of techniques to reduce seed predation
4. Provide outreach services for owners of reserves and other sites.

Narrative Outline of Recovery Actions

1. Preserve and Manage at least 18 Nelson's checker-mallow reserves

Most extant Nelson's checker-mallow occurrences, particularly those in the Willamette Valley, are highly vulnerable to disturbance and extirpation. In order to ensure the long-term survival of the species, at least 18 Nelson's checker-mallow population reserves should be established and perpetually managed for the benefit of the species. Protection of these reserves can be accomplished by conservation agreements with other agencies or tribes, conservation easements, species-specific management plans on Service lands, land acquisition, or through the Habitat Conservation Planning (HCP) process under section 10(a)(1)(B) of the Act. Protection and maintenance, in perpetuity, of these reserves constitute the core of the recovery strategy for Nelson's checker-mallow.

To maximize genetic, ecological, and geographical variation in Nelson's checker-mallow, and reduce vulnerability to random events, reserves should be distributed among nine hydrologic subbasins (Figure 1) spanning the range of the species. All of the hydrologic subbasins with extant populations of Nelson's checker-mallow were selected as recovery zones. Upper Willamette, middle Willamette, south Santiam, Molalla-Pudding, Yamhill, and Tualatin subbasins are located in the Willamette Valley. The Wilson-Trask-Nestucca subbasin is located in the Coast Range. The lower Columbia-Clatskanine and upper Chehalis subbasins are located in the Puget Trough. These subbasins are briefly discussed below:

The upper Willamette subbasin represents the southern distribution of Nelson's checker-mallow, roughly in Benton, Linn and Polk Counties, Oregon. The largest, highest-quality remaining populations of Nelson's checker-mallow in the Willamette Valley are concentrated in this area. The upper Willamette subbasin must contain at

least two population reserves. Due to the large number of occurrences and possibly greater genetic variation across this zone, conservation would be enhanced with more than the minimum of two. A population of plants occupying about 0.25 hectares (0.6 acres) is protected and monitored by the Service on the Finley National Wildlife Refuge. Several other populations of moderate to large size occur on public lands within the upper Willamette subbasin, including lands owned and managed, entirely or in part, by the Oregon Department of Fish and Wildlife (ODFW), Oregon State University (OSU), and the City of Corvallis (Appendix I).

The middle Willamette subbasin represents about 15 Nelson's checker-mallow populations in Marion and Polk Counties, Oregon, including the westernmost known populations occurring where the Willamette Valley transitions into the foothills of the Coast Range. This subbasin must contain at least two population reserves. Most extant populations in this subbasin are small to moderate size. Populations on public land include several owned and managed, in part or entirely, by the Oregon Department of Transportation (ODOT). During preparation of this plan, the Service and ODOT were discussing development of a statewide conservation agreement for listed and candidate species occurring in State Highway right-of-ways. This subbasin includes Nelson's checker-mallow populations on the east side of the Willamette River in Marion county, Oregon. These are the only occurrences of the plant east of the Willamette River. A population of moderate size occurs on public lands owned and managed by the City of Salem at the Salem Airport (Appendix I). The Airport is currently developing a conservation agreement with the Service to monitor and manage this population.

The south Santiam subbasin encompasses four extant Nelson's checker-mallow populations in Linn County, Oregon. Unfortunately these extant populations are small and occur very close together.

The Molalla-Pudding subbasin contains a single remaining population in Marion County, Oregon on Fletcher Road. This population needs to be protected immediately and suitable habitat within this subbasin searched for new populations or a site to introduce Nelson's checker-mallow plants into.

The Yamhill subbasin includes six populations of Nelson's checker-mallow that occur in Polk and Yamhill Counties Oregon. A population of moderate size occurs on lands owned and managed by the Confederated Tribes of the Grand Ronde (Appendix I). A conservation agreement has been signed between the Confederated Tribes and the Service to protect, monitor, and manage plants on Tribal lands near the community of Grande Ronde. The Service recognizes that the United States and the Confederated Tribes of Grand Ronde (Tribe) have a unique and distinctive government-to-government relationship. Consistent with this relationship, the Service shall defer to any conservation and management plans instituted by the Tribe regarding Nelson's checker-mallow for tribal trust and fee lands. If the Tribe develops and implements scientifically credible management and conservation plans for tribal trust and fee lands, the Tribe's responsibility under the Recovery Plan shall be limited to the proportion of its own population of Nelson's checker-mallow to the total population of the plant in the Yamhill subbasin. all such management and conservation plans will be updated by the Tribe, from time-to-time, consistent with any land acquisitions or sales by the Tribe within the Yamhill subbasin. Active management is occurring on the Tribe's lands, with a prescribed burn carried out in the fall of 1995. A private site, Garh Farm, includes a 8.5 hectare (21-acre) wetland prairie native restoration site and is being actively managed by the land owner for maintenance of Nelson's checker-mallow plants. Establishing two preserves should not be a problem in this subbasin.

The Tualatin subbasin includes two populations in Washington County, Oregon. The Forest Grove population consists of a single plant adjacent to a State Highway and the

Waibel farm contains a population of 165 plants. Seeds from both these sites need to be banked early to preserve germ plasm from this subbasin.

The Wilson-Trask-Nestucca subbasin is located in the geographically and ecologically distinct Coast Range distribution of the species, including populations in Yamhill, Washington, and Tillamook Counties. This zone must contain two population reserves to meet the recovery objective. However, since this is a distinctly different ecosystem, conservation of the species would be better enhanced by establishing at least three population reserves. The largest known population occurs on lands at Walker Flat, owned and managed by the BLM and the City of McMinnville. The City of Hillsboro has entered into a memorandum of agreement regarding this species as part of a section 7 consultation during the expansion of the storage capacity at Barney Reservoir. Two large populations occur on private lands in this subbasin (Appendix I).

The lower Columbia River-Clatskanine subbasin represents a portion of Nelson's checker-mallow's range in Cowlitz County, Washington that is part of the Puget Trough. Unfortunately, only one extant population is known in this subbasin and is quite small.

The upper Chehalis contains a single population in Lewis County, Washington that is on private lands. In 1995, 60 flowering plants were observed. The non-flowering *Sidalcea* plants were not counted on the initial discovery of the population because the correct identification to species could not be determined from vegetative material. In 1997, CH2M Hill revisited the site and found only 13 plants total (both flowering and non-flowering). Seeds need to be gathered immediately from this populations to ensure that this most northern population genetic material is not lost.

In order to protect populations of Nelson's checker-mallow in perpetuity, reserves must be selected, appropriate boundaries must be delineated, and management plans must be developed and implemented. Until the reserve sites are selected and recovery actions are in place, all populations on public lands should be protected to the maximum extent possible.

1.1 Evaluate the status of all extant populations

The purpose of this task is to assemble all available information necessary to make informed decisions about which populations can or cannot contribute to the recovery of the species. Ownership of all population localities should be determined, especially for populations that might have more than one owner. For each population, ascertain current land management objectives and any planned or likely activity that might harm Nelson's checker-mallow. Ask willingness of landowners/managers to participate in recovery of Nelson's checker-mallow.

Appendix I provides a list of all known extant Nelson's checker-mallow populations. Figure 2 displays a number-coded map of all populations.

1.2 Select reserve sites

Reserve locations in the nine subbasins will be selected in consultation with individual private landowners, public land managing agencies, and other knowledgeable individuals.

The most suitable available sites will be selected, based on factors including (but not limited to) land ownership, current population size (area occupied by the species), presence of seedlings, population gender structure, habitat quality, surrounding land uses, site management needs, feasibility of providing needed habitat management treatments, security of sites from vandalism and disturbance,

and adequate acreage of contiguous habitat to provide for population expansion, natural recruitment, and possible demographic augmentation.

The Service and the Confederated Tribes of Grand Ronde have agreed that the Tribe's responsibility under the Recovery Plan is limited to the proportion of its own population of Nelson's checker-mallow to the total population of the plant in the Yamhill subbasin.

1.3 Delineate reserve boundaries

Boundaries of selected reserves should be accurately identified to ensure precision and efficiency in habitat acquisition and/or development of conservation agreements and easements and HCPs, to provide identifiable limits for the purposes of population monitoring and habitat management, and to help avoid unintentional population disturbance resulting from management of adjacent lands.

Factors to consider when delineating reserve boundaries include, but are not limited to: provision of adequate unoccupied habitat to allow for population expansion, provision for buffers around the population to diminish impacts from surrounding land uses and edge effects, distribution of suitable habitat, and patterns of land ownership.

Once reserve boundaries have been identified, they should be accurately depicted on aerial photos, large scale topographic maps, and accessible geographic information system data bases and visibly marked in the field.

1.4 Protect reserves

In order to reliably provide for the recovery and long-term survival of Nelson's checker-mallow, reserve sites must be permanently protected. This can be done

through a variety of measures, including protection of sites on public lands through management plans, acquisition from willing sellers, conservation agreements or easements, HCPs, or other legally binding documents.

1.5 Evaluate reserve population status

Monitoring of the reserve population is needed to evaluate reserve population status and determining if, or when, reserve populations have achieved population size and structure criteria stipulated by the recovery objective. An accurate assessment of population size and structure are also necessary to evaluate the effects of active management (Task 1.5), and to determine the need for population augmentation (Tasks 1.63 and 1.73).

1.51 Conduct populations monitoring

Reserve populations should undergo monitoring to determine if the populations are stable, identify trends and fluctuations in population frequency distribution and geographic movement/expansion, assess possible population augmentation needs, and identify when the combined subbasin populations achieve (or fall below) the criterion of 0.3 hectares (0.74 acres) of habitat occupied by Nelson's checker-mallow plants. The monitoring program must be sensitive enough to detect a 10 percent drop in frequency.

1.52 Conduct demographic monitoring

Statistically valid monitoring for selected reserve populations in the Coast Range, Willamette Valley, and Puget Trough should be conducted annually to provide information on population growth or decline and population age structure (abundance of seedlings and young plants), to assess population self-sustainability, and to project long-term population trends. Demographic monitoring will involve annual tracking of the fates of individuals within

sampling plots, including data collection on seedling recruitment, plant age/developmental stage, and plant mortality and dormancy.

1.6 Manage reserves in Willamette Valley and Puget Trough

Passive protection of plants from human disturbance will likely be inadequate to maintain Nelson's checker-mallow in perpetuity in its altered and dynamic environment. In addition to protection, comprehensive habitat management will be needed to encourage natural population recruitment and achieve the reserve population size and age structure criteria discussed in this plan. The evaluation of the effects of active management should be based on the results of the population monitoring (Tasks 1.51, 1.52).

Management strategies should be tailored for each reserve, based upon the management needs at each site. These strategies should be incorporated into written comprehensive site-specific reserve management plans. These site specific management plans will be different for populations occurring in the Coast Range from those occurring in the Willamette Valley or Puget Trough of Washington. One of the major differences is the threats facing these populations.

1.61 Reduce succession and competition threats on protected areas

Nelson's checker-mallow occupies open, early successional habitats and does not tolerate encroachment by trees and shrubs. Nelson's checker-mallow is also very likely adversely impacted by competition with invasive alien species, especially introduced, thatch-forming, forage grasses. Reserves must be actively managed to maintain suitable habitat. Methods may include periodic prescribed burning, mowing, and manual removal of woody vegetation. Optimal intensity, timing, and frequency of these treatments may vary between reserves, and will need to be determined through future research and management experience. Until such results are available, the following general management guidelines are recommended:

Burning. For areas with significant thatch or significant encroachment by shrubs and trees, prescribed burning should be evaluated. Prescribed burning should be scheduled in fall or early winter to avoid damage to actively growing Nelson's checker-mallow plants, and reduce the potential for fire escape. Burning may be useful in eliminating thatch accumulation, reducing predator and pathogen populations, enhancing seed germination, and maintaining early successional species.

Mowing: Mowing should take place in late summer, after maturation of Nelson's checker-mallow seeds and the plants have gone dormant. Mowing will help curb establishment of trees and shrubs, and may restrict growth of some competitive perennial weeds.

Vegetation removal: Manual removal of trees and shrubs (those not otherwise eliminated by burning or mowing) will reduce the threat of shading on Nelson's checker-mallow, and should be conducted in a manner that minimizes intensive ground disturbance (which typically promotes colonization of weeds) and alterations to local surface hydrology. Girdling of trees may be an alternative to cutting and removal if remaining biomass does not continue to seriously shade plants.

The above methods may also reduce the threat from competition from alien species. Mowing versus fire needs to be evaluated to ensure that either or both methods do not decrease the numbers, or affect the population structure, of Nelson's checker-mallow. Appropriate native species should be used instead of alien species such as orchard grass (*Dactylis glomerata*) or tall fescue for replanting and erosion control in disturbed areas within 30 meters (100 feet) of Nelson's checker-mallow conservation sites. Use of native vegetation will reduce the likelihood of introduction of alien species

into the reserve, and presumably benefit Nelson's checker-mallow. Weed-free straw should also be required on construction sites adjacent to Nelson's checker-mallow conservation areas. Total elimination of alien species is probably not feasible and may not be necessary to accomplish the recovery of Nelson's checker-mallow. Studies (Task 2.4) should provide information about which methods are of most benefit to the conservation of Nelson's checker-mallow.

1.62 Reduce seed predation threat to protected populations

Seed predation by weevils is primarily a threat at the Willamette Valley floor occurrences. Since most of the valley floor occurrences are quite small, any seed reduction will significantly reduce the chances of these occurrences surviving in the future. Thus, when weevils are observed in small occurrences within reserves, efforts should be made to reduce weevil numbers, thereby increasing seed output. Studies identified in task 2.6 should provide information about which pesticides and methods of application are most effective in controlling weevils.

1.63 Augment populations, if necessary

Although habitat management will likely foster natural population recruitment, reserve populations may require one-time or periodic augmentation through artificial introduction of new individuals in order to achieve the minimum required size of 0.3 occupied hectares (0.74 acres) of habitat occupied by Nelson's checker-mallow plants for each subbasin. Each reserve site will need to be evaluated to determine if augmentation is needed. A conservative approach to artificial population augmentation is recommended and the technique should only be used when clearly necessary.

1.631 Procure seeds

Seeds to augment reserve populations should originate exclusively from the parent reserve population, to maintain the genetic distinctness of populations and avoid possible disruption of favorable, locally adapted gene complexes (i.e., outbreeding depression). Use of seeds originating from outside populations should take place *only* in instances where inbreeding depression and low genetic variability occurs or when the evidence indicates a reasonable probability that inbreeding is limiting the population's long-term survival. Seeds that are currently stored in seed banks could be used in lieu of collection of fresh seed from the population. If seeds are to be freshly collected, they should be collected when fully mature (indicated by light to dark brown seed coats), because the use of immature (green) seeds tends to result in lower germination success. Collection of seeds should be distributed evenly among as many individuals within populations as possible so the offspring have genotypes and sex ratios representative of the entire population.

1.632 Establish plants

Augmentation of the reserve population may be done by scattering seed on prepared seed beds at the augmentation sites, by transplanting greenhouse-raised seedlings, and/or by transplanting plants generated from rhizome cuttings.

Field establishment studies conducted by CH2M Hill (1986) in the Coast Range reported 89 percent of greenhouse-grown seedlings survived the first year after transplant, compared to 100 percent of the rhizomes transplanted surviving the first year. No attempt was made to scatter seed at the site as a possible augmentation process.

ODA (unpublished data) found that Nelson's checker-mallow seeds germinate readily after artificial scarification of the seed coat, and resulting plants can reach mature size and produce flowers within six months under favorable greenhouse conditions. One propagation schedule that has worked well involves fall germination and planting of seeds. Plants were kept in the greenhouse for 6 months, and when they were the same size as wild plants, they were moved to an outdoor shelter to overwinter. Potted plants should be buried or otherwise insulated to prevent damage from freezing (S. Gisler, pers. comm., 1997).

If the preferred augmentation approach is to use greenhouse plants grown from seeds, following the propagation schedule recommended above, propagated plants can be transplanted in the spring when the soil is moist, which allows for the plants to become established before the onset of the dry season. Care must be taken not to bring greenhouse/garden pathogens and/or herbivores with the plants.

Whatever techniques are used, augmentation programs should be conducted as rigorous scientific experiments in which management-oriented hypotheses are addressed quantitatively, in a statistically sound manner. Long-term monitoring must be an integral part of any augmentation project.

1.7 Manage reserves in Coast Range

While protection of Nelson's checker-mallow sites and plants from human disturbance is necessary, passive protection alone is probably inadequate to maintain the species in perpetuity in its altered and dynamic environment. Comprehensive habitat management is needed to encourage natural population

recruitment and achieve the reserve population size and age structure criteria discussed in this plan. Evaluation of the effects of active management should be based on the results of population monitoring (Tasks 1.51 and 1.52).

Management should be tailored to each reserve, based on its management needs, and should be guided by written comprehensive site-specific reserve management plans. Plans for populations in the Coast Range will be substantially different for populations in the Willamette Valley or Puget Trough of Washington, largely because of differences in threats.

1.71 Reduce succession and competition

Timber harvest adjacent to meadows occupied by Nelson's checker-mallow may benefit populations by creating temporary open areas for population expansion. Thus timber harvest may be an essential management tool for keeping the site in an early-successional condition. Precautions need to be taken regarding how the harvest is conducted which include the use of herbicides for vegetation control, and minimizing ground disturbance so that invasive weeds will not become a problem.

At Walker Creek, browse activity by elk has changed. Attracted to new nearby clear-cut areas, they are no longer foraging heavily on wetland brush species, thus not keeping the brush down and in balance with *Sidalcea* requirements. Over 44 percent of the habitat within the Walker Creek Meadow site has woody species present (Guerrant 1997). These woody plant species are concentrated in the relatively small area (narrow corridor) within the portion of Walker Creek that is also occupied by the bulk of the Nelson's checker-mallow plants (Guerrant 1997). This narrow corridor at Walker Creek would seem to be the place where any woody-vegetation control measures would most effectively be applied first. In contrast, the

invasive, weedy, tansy ragwort (*Senecio jacobaea*) seems to be found primarily in the more open area of the Walker Creek Meadow, and even there, does not seem to be closely associated with *Sidalcea* plants. Thus, it needs watching but probably is not a current threat to the Coast Range populations. See task 1.61 for techniques to control woody vegetation.

1.72 Reduce impacts from off highway vehicles (OHV)

Several Coast Range populations of Nelson's checker-mallow are disturbed by recreational use by motorcyclists. Where current OHV use impacts the reserve population, trails should be rerouted or closed in that area. The Walker Flat BLM Area of Critical Environmental Concern (ACEC) could have signs posted warning against illegal OHV use and against motorcycle use. When new OHV trails are contemplated in the vicinity of *Sidalcea* populations, the proposed routes should be examined for the presence of the species, and the trails rerouted if necessary to avoid an adverse impact.

1.73 Augment populations, if necessary

Refer to the narrative for task 1.63.

1.731 Procure seeds

Refer to the narrative of task 1.631

1.732 Establish plants

Refer to the narrative of task 1.632

2. *Ex situ* banking of seeds

Banking (long-term cryogenic storage) of Nelson's checker-mallow seeds is recommended to provide an additional level of security to the recovery and long-term survival of the species, by creating a demographic and genetic reserve of Nelson's

checker-mallow propagules. *Ex situ* storage of seeds may be particularly vital in instances when natural soil seed banks are depleted due to poor seed production and pre- and post-dispersal seed mortality. Stored seeds may be useful in augmentation of Nelson's checker-mallow populations, mitigation of future population losses, and sources of genetic variability in the event reserve populations suffer from inbreeding depression and/or allele fixation through genetic drift.

2.1 Rank populations

In order to develop a systematic and efficient method of banking seeds, all known extant Nelson's checker-mallow populations should be ranked based on genetic variability as documented in research conducted under Task 3.1 and 3.2. Seed collection and banking should emphasize the preservation of the range of genetic variability. Among populations of similar genetic composition, the highest seed collection and banking priorities should be given to small, privately owned populations, and any other populations believed vulnerable to imminent disturbance or destruction. Landowner permission must be acquired before seed collections can be made. The single population in Lewis County, Washington is obviously very important for seed collection because it is small and geographically isolated from other populations.

2.2 Collect and bank seeds

As noted above, the Lewis County, Washington population is a top priority. Seeds should be collected when mature, to ensure optimal viability. Mature seeds typically exhibit light to dark brown seed coats. Immature (green) seeds should be avoided. Seeds should be collected from as many individuals within populations as possible, to enhance total population representation of genotypes and sex types. Seeds should be deposited at a legitimate seed banking facility, such as the Berry Botanic Garden Seed Bank for Rare and Endangered Plants of the Pacific Northwest, located in Portland, Oregon.

3. Conduct studies on factors that threaten recovery of the species

Although previous research has already provided a great deal of information about Nelson's checker-mallow, there remain many critical questions about the nature and extent of threats to the species. Greater understanding of the following issues will provide insight that will aid in the recovery of Nelson's checker-mallow.

3.1 Evaluate population fragmentation and gene flow

As populations become fragmented, information is needed on how far apart these population fragments can be before gene flow stops and the fragments undergo genetic isolation. Many of the occurrences probably result from fragmentation and, therefore, additional studies are needed to evaluate the impacts of genetic isolation on levels of inbreeding depression (if any), intra-population genetic variability, and rates of genetic drift.

3.2 Evaluate inter-population genetic variability

In order to design Nelson's checker-mallow reserves and establish collection priorities for seed banking, information is needed on the levels and patterns of genetic variability that exist among extant populations. Furthermore, to assess the adequacy of the subbasin boundaries, information on the genetic diversity within and between subbasins is needed. If augmentation of a population with seeds from other occurrences or other subbasins is deemed necessary, the genetic distinctiveness of the population needs to be determined.

3.3 Evaluate population self-sustainability

Studies need to be conducted which determine the population sizes (numbers of individuals) necessary to support viable reserve populations. These studies need to evaluate what effective sizes of populations are in terms of genets (genotypes), rather than ramets potentially resulting from clonal spread, and how this might influence the definition of minimum viable population size. A determination of

the population gender and age structures is also necessary for long-term stability or growth.

3.4 Evaluate ways to reduce threats of competition by aliens

It has been assumed that competition by non-native plants limit Nelson's checker-mallow population recruitment and plant vigor. This assumption needs to be validated and, if correct, techniques to reduce the threat of competition from these species should be evaluated.

3.5 Evaluate efficacy of habitat management techniques

Information is needed on the response of Nelson's checker-mallow to different vegetation management methods (i.e, mowing, burning, and manual over story removal), and which methods most benefit the species. These studies should also assess which combinations, frequencies, and intensities of these methods are optimal.

3.6 Evaluate efficacy of techniques to reduce seed predation

Information is needed on which insecticides and application rates are most useful in decreasing infestation levels of weevil seed predators. These studies also need to gather information on the impacts pesticides have on insect pollinators of Nelson's checker-mallow. Biological control methods should also be investigated as alternatives in controlling seed predation by weevils

4. Provide outreach services for owners of reserves and other sites.

The reserves and other sites will be in a variety of ownerships. This recovery plan will only work with the participation of landowners, whether public or private. Along with assistance with management and provision of monitoring services (especially on private lands), outreach possibilities include landowners' field trips, newsletters, and

integration of conservation of Nelson's checker-mallow into the overall conservation of native grasslands in this region.

Literature Cited

Baldwin, E. M. 1981. Geology of Oregon. Third edition. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Barrett, S.C.H. and J. Kohn. 1991. Genetic and evolutionary consequences of small population size in plants: implications for conservation. In: Falk and Holsinger (eds.) 1991. Genetics and conservation of rare plants. Oxford University Press, New York.

Beardmore, J.A. 1983. Extinction, survival, and genetic variation. In Schoenwald-Cox, Chambers, McBryde, and Thomas (eds.) 1983. Genetics and conservation. Benjamin-Cummings, Menlo Park, CA.

Bureau of Land Management (BLM). 1985. Distribution and condition of *Sidalcea nelsoniana* Piper: a report to the Fish and Wildlife Service for status determination. Unpublished report prepared by the Bureau of Land Management, Salem District.

Boyd, R. 1986. Strategies of Indian burning in the Willamette Valley. Canadian Journal of Anthropology 5:65-84.

Boyd, R. and L. L. Sarafini. 1992. Reproductive attrition in the rare chaparral shrub *Fremontodendron decumbens* Lloyd (Sterculiaceae). American Journal of Botany 79:1264-1272.

Burchick, M. 1993. The problems with tall fescue in ecological restoration. Environmental Concern Inc. Wetland Journal 5:16.

CH2M Hill. 1986-1996. Studies of *Sidalcea nelsoniana*. Unpublished annual research reports and technical memoranda prepared by CH2M Hill for McMinnville Water and Light, submitted to the Service.

Franklin J. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Guerrant, Edward O. 1997. Monitoring Nelson's checker-mallow (*Sidalcea nelsoniana*) at Walker Flat, Neverstill, and South McGuire: 1997. Unpublished report prepared for the Bureau of Land Management, Salem District.

Halse, R. R., B.A. Rottink, and R. Mishaga.1989. Studies in *Sidalcea* taxonomy. Northwest Science 63(4):154-161.

Hamilton, W.D. 1982. Pathogens as causes of genetic diversity in their host populations. In: Anderson and May (eds.) 1982. Population biology of infectious diseases. Springer-Verlag, New York.

Hegazy, A. K. and N. M. Eesa. 1991. On the ecology, insect seed-predation, and conservation of a rare and endemic plant species: *Ebenus armitagei* (Leguminosae). Conservation Biology 15:317-354.

Hitchcock, C. L. 1957. A study of the perennial species of *Sidalcea*. University of Washington Publications in Biology 18:1-79.

Johannessen, C.L., W.A. Davenport, A. Millet, and S. McWilliams. 1971. The vegetation of the Willamette Valley. Ann. Assoc. Am. Geogr. 61:286-302.

Lande, R. 1995. Mutation and conservation. Conservation Biology 9:783-791.

Louda, S. M. 1983. Seed predation and seedling mortality in the recruitment of a shrub, *Haplopappus venetus* (Asteraceae), along a climatic gradient. Ecology 64:511-521.

Maret, M. P. 1997. Effects of fire on seedling establishment in upland prairies of the Willamette Valley, Oregon. M.S. Thesis, Oregon State University, Corvallis, Oregon.

Moir, W. and P. Mika. 1972. Prairie vegetation of the Willamette Valley, Benton County, Oregon. Unpublished report on file at USDA Forest Service, Forestry Science Laboratory, Corvallis, Oregon. 29 pp. and appendix.

Oregon Department of Agriculture (ODA). 1995. *Sidalcea nelsoniana*: Preliminary report of Oregon Department of Agriculture research results (1994) and examination of previous MWL-sponsored research. Unpublished report written by Oregon Department of Agriculture, Plant Conservation Biology Program.

Oregon Natural Heritage Program. 1996. Oregon Natural Heritage Program — database for rare, threatened and endangered plants. Portland, Oregon.

Pavlik, B. M., N. Ferguson, and M. Nelson. 1993. Assessing limitations on the growth of endangered plant populations, II. Seed production and seed bank dynamics of *Erysimum capitatum* ssp. *angustatum* and *Oenothera deltoides* ssp. *howellii*. Biological Conservation 65:267-278.

Windus, J. L. and A. A. Snow. 1993. Fruit set and seed predation in an Ohio population of *Gentiana saponaria*. American Midland Naturalist 129:346-351.

IMPLEMENTATION SCHEDULE

The following Implementation Schedule is a guide for meeting the objectives discussed in Part II of this plan. This schedule indicates task priorities, task numbers, brief task descriptions, duration of tasks, the responsible agencies, and lastly, estimated costs. These actions, when accomplished, should bring about the recovery of the species and protect its habitat. Priorities in column one of the following implementation schedule are assigned as follows:

Priority 1:	An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
Priority 2:	An action that must be taken to prevent a significant decline in the species' population/habitat quality or some other significant negative impact short of extinction.
Priority 3:	All other actions necessary to meet the recovery objective.

Key to Acronyms used in Implementation Schedule

Berry - Berry Botanical Garden
BLM- Bureau of Land Management
Benton - Benton County, Oregon
Corvallis - City of Corvallis
FWS- U.S. Fish and Wildlife Service, Oregon State Office
Finley - Finley National Wildlife Refuge
Hillsboro - City of Hillsboro
Linn - Linn County, Oregon

Marion - Marion County, Oregon

McMinnville - City of McMinnville

ODA- Oregon Department of Agriculture

ODOF - Oregon Department of Forestry

ODOT - Oregon Department of Transportation

ODFW - Oregon Department of Fish and Wildlife

OSU - Oregon State University

Polk - Polk County, Oregon

WDNR - Washington Department of Natural Resources

Tribe - Confederated Tribes of the Grand Ronde

Yamhill - Yamhill County, Oregon

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* - Lead Agency

Recovery Plan Implementation Schedule for Nelson's checker-mallow

Priority	Task #	Task Description	Duration (Years)	Responsible Party	Total Cost	Cost Estimates, in thousands of dollars per fiscal year									
						FY1	FY2	FY3	FY4	FY5	FY6	FY7	FY8	FY9	FY10
1	1.1	Evaluate the status of all extant populations	1	FWS*, ODA, WDNR	32.0	32.0									
1	1.2	Select reserve sites	1	FWS*, ODA, WDNR, BLM, Benton Co., Corvallis, Finley, Hillsboro, Linn Co., Marion Co., McMinnville, ODOF, ODOT, ODFW, OSU, Salem, Tribe	17.0	17.0									
1	1.3	Delineate reserve boundaries	2	FWS*, ODA, WDNR, BLM, Benton Co., Corvallis, Finley, Hillsboro, Linn Co., Marion Co., McMinnville, ODOF, ODOT, ODFW, OSU, Salem, Tribe	114.0		57.0	57.0							
1	1.4	Protect reserves	10	FWS*, ODA	600.0			60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
1	4	Outreach services for owners of reserves and other sites.	Annual	FWS*, ODA, WDNR	65.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
2	1.51	Conduct census	Annual	FWS*, ODA, WDNR, BLM Benton Co., Corvallis, Finley, Hillsboro, Linn Co., Marion Co., McMinnville, ODOF, ODOT, ODFW, OSU, Salem, Tribe	720.0		60.0	60.0	60.0	60 .0	60.0	60.0	60.0	60.0	60.0
2	1.52	Conduct demographic monitoring	Annual	FWS*, ODA	144.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	120.0

Priority	Task #	Task Description	Duration (Years)	Responsible Party	Total Cost	Cost Estimates, in thousands of dollars per fiscal year									
						FY1	FY2	FY3	FY4	FY5	FY6	FY7	FY8	FY9	FY10
2	1.61	Reduce succession and competition threat	Annual	FWS*, ODA, WDNR, Corvallis, Finley, ODOT, OSU, Salem, Tribe	1462.5		225.0	112.5	112.5	112.5	112.5	112.5	112.5	112.5	112.5
2	1.62	Reduce seed predation threat when necessary	Annual	FWS*, ODA, WDNR, Corvallis, Finley, ODOT, OSU, Salem, Tribe	180.0		15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
2	1.631	Procure seeds	Annual	FWS*, ODA, WDNR, Corvallis, Finley, ODOT, OSU, Salem, Tribe	180.0		15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
2	1.632	Establish plants	Annual	FWS*, ODA, WDNR, Corvallis, Finley, ODOT, OSU, Salem, Tribe	360.0		30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
2	1.71	Reduce succession and competition threat	Annual	FWS*, ODA, BLM, Hillsboro, McMinnville, ODOF	585.0		90.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
2	1.72	Reduce impacts from off highway vehicles	Annual	FWS*, ODA, BLM, Hillsboro, McMinnville, ODOF	72.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2	1.731	Procure seeds	Annual	FWS*, ODA, BLM, Hillsboro, McMinnville, ODOF	72.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
2	1.732	Establish plants	Annual	FWS*, ODA, BLM, Hillsboro, McMinnville, ODOF	144.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
3	2.1	Rank populations	1	FWS*, ODA, WDNR, Berry	12.0	12.0									
3	2.2	Collect and bank seeds	5	FWS*, ODA, WDNR, Berry	38.1	7.6	7.6	7.6	7.6	7.6					

Priority	Task #	Task Description	Duration (Years)	Responsible Party	Total Cost	Cost Estimates, in thousands of dollars per fiscal year									
						FY1	FY2	FY3	FY4	FY5	FY6	FY7	FY8	FY9	FY10
3	3.1	Evaluate population fragmentation and gene flow	3	FWS*, ODA	96.0	32.0	32.0	32.0							
3	3.2	Evaluate inter-population genetic variability	3	FWS*, ODA	96.0	32.0	32.0	32.0							
3	3.3	Evaluate population self-sustainability	1	FWS*, ODA	2.0					2.0					
3	3.4	Evaluate ways to reduce threats of competition by alien plants	3	FWS*, ODA	30.0		10.0	10.0	10.0						
3	3.5	Evaluate efficacy of habitat management techniques	3	FWS*, ODA	30.0		10.0	10.0	10.0						
3	3.6	Evaluate efficacy of techniques to reduce seed predation	3	FWS*, ODA	30.0		10.0	10.0	10.0						
3	4	Provide outreach services for owners of reserves and other sites	Annual	FWS*, ODA	65.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

APPENDIX I

Known Extant Nelson's checker-mallow Occurrences

Information provided by The Oregon Natural Heritage Program (ONHP) — Oregon Natural Heritage Database, CH2M Hill (1996), and Oregon Department of Agriculture (1995). Artificial (experimental) populations, and those believed extirpated, are not included.
Map # can be used to locate occurrences on Figure 2.

Population name	ONHP code	Map #	occupied area, square meters	Ownership
		Willamette Valley		
Upper Willamette (17090003)				
Benton County				
Bald Hill Park	110HO*037	1	316	City of Corvallis, private
Bellfountain Road	110H0*075	12	6	Benton County
Bellfountain 2	110H0*078	9	1	Benton County
Bull Run Creek	none	10	48	unknown
Decker Road	110H0*066	11	32	Benton County
E.E. Wilson	110H0*080	19	300	Oregon Dept. Fish and Wildlife
Finley National Wildlife Refuge	various	13	2,525	US Fish and Wildlife Service
Industrial Way	110H0*065	8	24	private
Jackson-Frazier	110H0*006	17	3	Benton County
Lewisburg	110H0*061	18	150	Oregon Dept. Transportation
OSU Horse Center	110H0*057	2	656	Oregon State University/ City of Corvallis
OSU Turkey Farm	110H0*043	3	1,784	Oregon State University/ City of Corvallis
Philomath North	110H0*046	7	1	private
Reservoir Road	110H0*074	4	1	private
Squaw Creek	110H0*062	5	70	private

Population name	ONHP code	Map #	occupied area, square meters	Ownership
Starker Park	none	6	49	City of Corvallis
Walnut Park	110H0*044	15	4	City of Corvallis
Water Works	110H0*063	16	56	City of Corvallis
Wren	110H0*050	14	83	Oregon Dept. of Transportation
Polk County				
Bridgeport School	110H0*001	21	15	unknown
McTimmonds Valley	110H0*052	20	700	private
Middle Willamette (17090007)				
Marion County				
Aumsville	110H0*042	34	16	Oregon Dept. Transportation
Burkland Lumber	110H0*039	35	158	private
KOA	110H0*016	37	2	private
Salem Airport	110H0*017	38	600	City of Salem
Santiam Interchange	110H0*077	39	81	Oregon Dept. Transportation
Wendland Farm	none	36	14	private
Polk County				
Baskett Slough	none	63	10	U.S. Fish & Wildlife Service
Dallas South	110H0*054	22	125	private
Meyers Road	none	64	4	U.S. Fish & Wildlife Service
SR22	110H0*047	23	58	Oregon Dept. Transportation
SR99W	110H0*048	24	251	Oregon Dept. Transportation
Salt Creek	110H0*053	26	266	private
South Santiam (17090006)				
Linn County				
Hess Road	110H0*040	33	359	private
Miller Cemetery	110H0*059	32	20	Linn County
Richarsdon Gap Road	none	60	2	private

Population name	ONHP code	Map #	occupied area, square meters	Ownership
Ridge Drive	110H0*005	30	18	private
Shelburn	110H0*059	31	2	private
Molalla-Pudding (17090009)				
Marion County				
Fletcher Road	110H0*018	41	27	Marion County
Walker Road	110H0*024	40	27	private
Yamhill (17090008)				
Polk County				
Dyck Road	110H0*038	25	200	private
Grand Ronde	110H0*079	28	781	Confederated Tribes of Grand Ronde
SR18	110H0*070	29	217	Oregon Dept. Transportation
VanWell Road	110H0*056	27	134	Oregon Dept. Transportation/private/ Polk County
Yamhill County				
Bellevue	110H0*021	42	12	private
Garh Farm	none	61	unknown	private
Panther Creek	110H0*002	44	22	Yamhill County
SR47	110H0*073	45	6	Oregon Dept. Transportation
Tree Farm	110H0*072	43	58	private
Tualatin (17080010)				
Washington County				
Forest Grove	none	62	1	Oregon Dept. Transportation
Waibel Farm	110H0*014	57	165	private

Population name	ONHP code	Map #	occupied area, square meters	Ownership
Wilson-Trask Nestucca (17100203)		**Coast Range**		
Tillamook County				
Devils Lake Fork	110H0*032	56	285	Oregon Dept. Forestry
Washington County				
Second Growth	110H0*068	55	149	City of Hillsboro
Yamhill County				
Conchy	110H0*076	51	81	private
Fairdale Complex	110H0*071	50	4,433	private
Meadow Lake	110H0*029	49	361	City of McMinnville
Nelson's Golden Valley	110H0*030	46	195	City of McMinnville
Nestucca River	110H0*031	48	5	City of McMinnville
North Fork	110H0*064	54	126	private
Tillamook Burn 1	110H0*060	52	4,460	private
Tillamook Burn 2	110H0*064	53	12	private
Walker Flat	110H0*028	47	7,008	Bureau of Land Management City of McMinnville
		Puget Trough		
Lower Columbia-Clatskanine (17080003)				
Cowlitz County (Washington)				
Coal Creek	none	58	111	private
Upper Chehalis (17100103)				
Lewis County (Washington)				
Not named	none	59	13	private

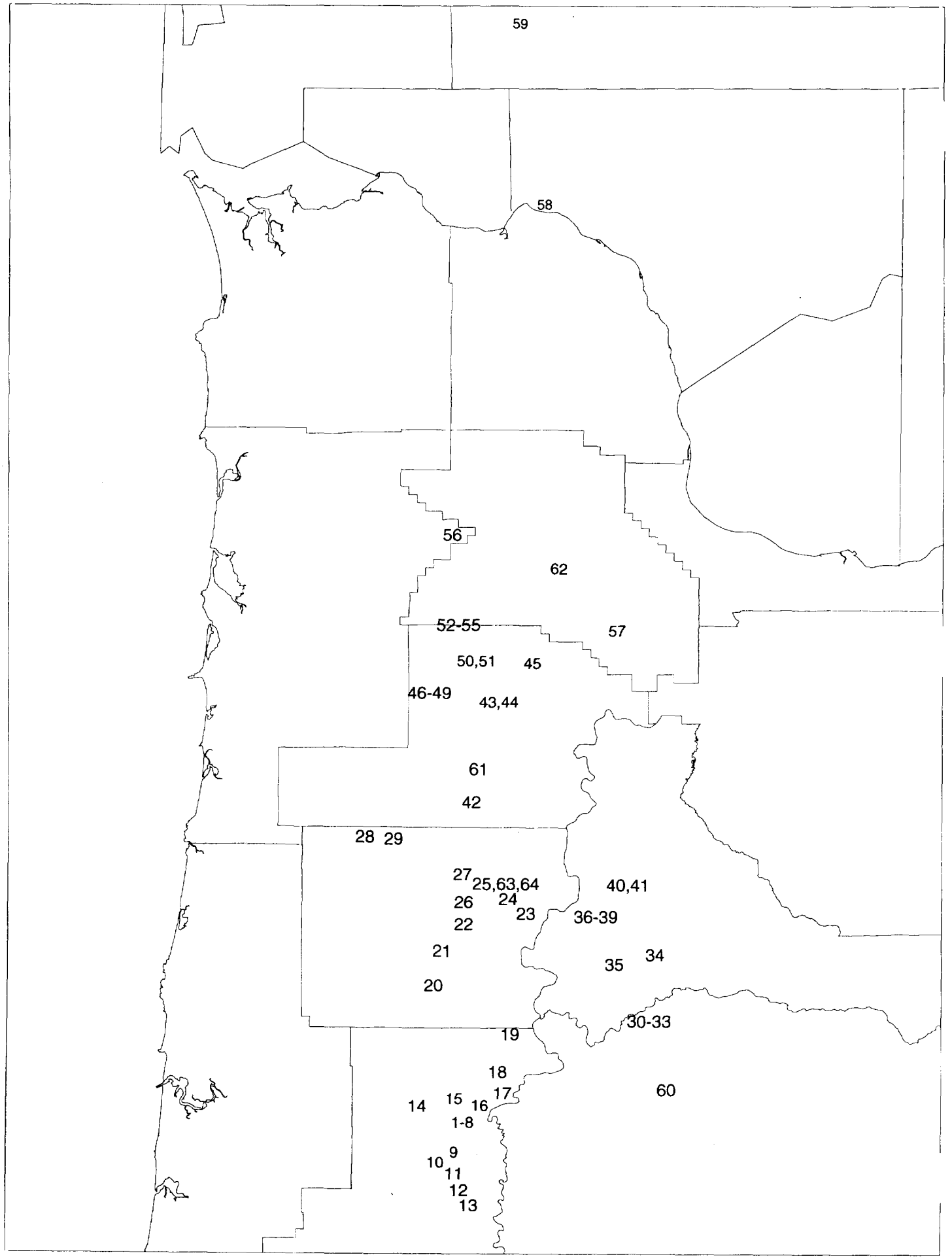

Figure 2. Map numbers correspond to Nelson's checker-mallow occurrences, as identified in the "Map#" column in Appendix 1. Map shows extant occurrences only, not extirpated or experimental populations.

APPENDIX 2

Summary of Agency and Public Comments on the Draft Nelson's Checker-mallow Recovery Plan.

I. Mailing List for the Draft Nelson's Checker-mallow Recovery Plan

On September 25, 1997, the Service released the draft recovery plan for Nelson's checker-mallow for a 60-day comment period, ending on November 24, 1997 (62 FR 50397). Over 70 copies of the draft plan were sent out for review in addition to the 63 agencies or elected public officials that were notified.

Only 10 letters/comments were received and five substantive issues provided beyond several clerical comments relating to wording or clarity. All of these comments were incorporated into this final plan.

The following is a list of those Agencies and Individuals being notified or receiving a copy of the plan for review. Those with an * received a copy of the plan and those with a ∫ provided comments.

Elected Federal and State Officials

Congresswoman Elizabeth Furse - District 1, 2701 NW Vaughn Suite 860, Portland, Oregon 97210.
Congressman Robert Smith - District 2, 843 E. Main Street Suite 400, Medford, Oregon 97504
Congressman Earl Blumenauer - District 3, 516 SE Morrison, Suite 250, Portland, Oregon 97214.
Congressman Peter DeFazio - District 4, 151 W 7th Ave. Suite 400, Eugene, Oregon 97401
Congresswoman Darlene Hooley - District 5, 315 Mission St. SE Suite 101, Salem, Oregon 97302.
Congressman Rich White - District 1, Mt Lake Terrace, Washington.
Congressman Jack Metcalf - District 2, Bellingham, Washington.
Congresswoman Linda Smith - District 3, Vancouver, Washington.
Congressman Doc Hastings - District 4, Kennewick, Washington.
Congressman George R. Nethercutt, Jr. - District 5, Spokane, Washington.
Congressman Norman D. Dicks - District 6, Tacoma, Washington.
Congressman Jim McDermott - District 7, Seattle, Washington.
Congresswoman Jennifer Dunn - District 8, Bellevue, Washington.
Congressman Adam Smith - District 9, Tacoma, Washington.
Governor John Kitzhaber, State Capitol, Salem, Oregon 97310.
Governor Gary Locke, Office of the Governor, P.O. Box 40002, Olympia, Washington 98504-0002.

Senator Gordon Smith, World Trade Center, 121 SW Salmon St., Portland, Oregon 97204.
Senator Ron Wyden, 151 W 7th Ave., Suite 435, Eugene, Oregon 97401.
Senator Slade Gorton, Belleview, Washington.
Senator Patty Murray, Seattle, Washington.
State Representative Tim Josi, District 2, 6740 Base Line Road, Bay City, Oregon 97107.
State Representative Charles Starr, District 3, H-338 State Capitol, Salem, Oregon 97310.
State Representative Terry Thompson, District 4, 5123 NW Agate Way, Newport, Oregon 97365.
State Representative Ron Adams, District 27, P.O. Box 305, Marylhurst, Oregon 97068.
State Representative Roger Beyer, District 28, 39486 S. Cooper Road, Molalla, Oregon 97038.
State Representative Leslie Lewis, District 29, P.O. Box 418, Newberg, Oregon 97132.
State Representative Larry Wells, District 30, 3080 Jefferson-Scio Drive SE, Jefferson, Oregon 97352.
State Representative Tom Whelan, District 32, 5214 Eastlake Court SE, Salem, Oregon 97302.
State Representative Peter Courtney, District 33, 2925 Island View Dr. N.,Salem, Oregon 97303.
State Representative Lane Shetterly, District 34, P.O. Box 1025, Dallas, Oregon 97338.
State Representative Barbara Ross, District 35, 4175 Morning Street, Corvallis, Oregon 97330.
State Representative Carolyn Oakley, District 36, 3197 Crest Lane NW, Albany, Oregon 97321.
∫ State Representative Liz VanLeeuwen, District 37, 27070 Irish Bend Ln, Halsey, Oregon 97348.
State Representative Patti Milne, District 38, P.O. Box 627, Woodburn, Oregon 97071.
State Senator Joan Dukes, District 1, S318 State Capitol, Salem, Oregon 97310-170.
State Senator Gary George, District 2, 15195 NE Ribbon Ridge, Newberg, Oregon 97132.
State Senator Jeannette Hamby, District 5,
State Senator Randy Miller, District 13, P.O. Box 1795, Lake Oswego, Oregon 97035.
State Senator Marylin Chignon, District 15, 7955 Portland Road NE, Brooks, Oregon 97305.
State Senator Gene Derfler, District 16, 1408 34th Avenue NW, Salem, Oregon 97304.
State Senator Shirley Stull, District 17, P.O. Box 21358, Keizer, Oregon 97307-1358.
State Senator Cliff Trow, District 18, 1835 NW Juniper Place, Corvallis, Oregon 97330.
State Senator Mae Yih, District 19, 34465 Yih Lane. Albany, Oregon 97321.

County Officials
Commissioners Benton County, Courthouse, 120 NW 4th, Corvallis, Oregon 97330.
Commissioners Linn County, Courthouse, 300 4th Avenue SW, Albany, Oregon 97321.
*Director Linn County Road Department, 3010 SW Ferry, Albany, Oregon 97321.
Commissioner Marion County, 100 High Street NE, Salem, Oregon 97301.
Commissioner Polk County, Courthouse 850 Main Street, Dallas, Oregon 97338.
*Director Polk County Public Works Department, 751 SW Clay Street, Dallas, Oregon 97338.
Commissioner Washington County, 155 N. 1st Avenue, Hillsboro, Oregon 97124.
Commissioner Yamhill County, Courthouse 535 NE 5th, McMinnville, Oregon 97128.

*Director, Yamhill County Road Department, 2060 Lafayette Avenue, McMinnville, Oregon 97128.

City Officials

Mayor, City of Corvallis, P.O. Box 1083, Corvallis, Oregon 97339.

∫ Director Rene D. Moye, Corvallis City Parks and Recreation, 1310 SW Avery Park Drive, Corvallis, Oregon 97333.

Director Public Works Department City of Corvallis, 360 SW Avery Avenue, Corvallis, Oregon 97333.

Mayor City of Forest Grove, P.O. Box 326, Forest Grove, Oregon 97116.

Mayor City of Hillsboro, 123 W. Main Street, Hillsboro, Oregon 97123.

*Mr. Tim Ewart, City of Hillsboro, 123 Main Street, Hillsboro, Oregon 97123.

Mayor City of McMinnville, 230 NE 2nd Street, McMinnville, Oregon 97128.

Mayor City of Salem, 555 Liberty Street SE, Salem, Oregon 97301.

*Mr. Tom Long, Airport Operations Coordinator, City of Salem, 555 Liberty Street SE Room 320, Salem, Oregon 97302.

*Director City of Salem Public Works Department, 5155 Silverton Road SE, Salem, Oregon 97305.

*Water Resource Coordinator Tina Schweickert, City of Salem Public Works Department, 5155 Silverton Road SE, Salem, Oregon 97310

Federal Agencies

*Karen Colbank, U.S. Army Corps of Engineers, Environmental Resources Branch, Attn.. Robert Willis, 333 SW 1st Avenue, Portland, Oregon 97208.

* John Willoughby, Botanist, Bureau of Land Management, 2800 Cottage Way, Sacramento, California 95825-1889.

*National Botanist Ken Berg, Bureau of Land Management, Division of Wildlife and Fisheries, 1849 C street, NW, Washington D.C. 20240.

*Botanist Cheryl A. McCaffrey, Bureau of Land Management - Oregon State Office, 1515 S.W. 5th Avenue, P.O. Box 2965, Portland, Oregon 97208.

*Mr Steve Bahe, Bureau of Land Management, Salem District, P.O. Box 404, Tillamook, Oregon 97141.

∫ Mr. Andy Pampush, Bureau of Land Management, Salem District, P.O. Box 404, Tillamook, Oregon 97141.

∫ Mr. Larry Scofield, Bureau of Land Management, Salem District, 1717 Fabry Road S.E., Salem, Oregon 97306.

*Mr John Radosta, Bureau of Land Management, Salem District, 1717 Fabrey Road S.E., Salem, Oregon 97306.

*Joel Shaich, Environmental Protection Agency, 811 SW 6th Avenue, 3rd floor, Portland, Oregon 97204.

Director Leon Whitman, Federal Highway Administration, 222 SW Columbia, Suite 600, Portland, Oregon 97201.

*Endangered Plant Coordinator Peggy Olwell, National Park Service, Wildlife and Vegetation Division, P.O. Box 37127, Washington, DC. 20013-7127.

*State Conservationist Bob Graham, Natural Resource Conservation Service, 101 SW Main Street Suite 1300, Portland, Oregon 97204.

*Chris Nagano, U.S. Fish & Wildlife Service, Carlsbad Field Office, 2730 Loker Avenue West, Carlsbad, California 92008

*Staff Botanist Monty Knudsen, U.S. Fish & Wildlife Service, Office of Technical Support,333 SW 1st Avenue, Box 3623, Portland, Oregon 97208.

∫ Ms. Maura Naughton, U.S. Fish and Wildlife Service, Western Oregon Refuge Complex, 26206 Finely Refuge Road, Corvallis, Oregon 97333-9533

* Mr. Ted Thomas, U.S. Fish and Wildlife Service, Western Washington Office, 510 Desmond Drive, Lacey, Washington 98503.

State Agencies

*Robert Meinke, Oregon Department of Agriculture, 635 Capitol Street NE, Salem, Oregon 97310-0110

*Mr. Steven Gisler, Oregon Department of Agriculture, 635 Capitol Street NE, Salem, Oregon 97310-0110.

*Mr John I. Elegant, Oregon Department of Community Development, 555 Liberty Street SE, Salem, Oregon 97301.

*Director Jim Greer, Oregon Department of Fish and Wildlife, P.O. Box 59, Portland, Oregon 97207.

∫ State Forester James E. Brown, Oregon Department of Forestry, 2600 State Street, Salem, Oregon 97310.

*Master Planning and Heritage Assessment Coordinator Kathy Schutt, Oregon Department of Parks and Recreation, 1115 Commercial Street NE, Salem, Oregon 97310-1001.

*Nick Testa, Oregon Department of Transportation - Technical Service Branch, 1158 Chemeketa Street NE, Salem, Oregon 97310

*Ms. Dana Field, Oregon Division of State Lands, Policy & Planning, 775 Summer Street NE, Salem, Oregon 97310.

*Mr. Greg Mitchel, Oregon Military Department, AGI-ENV, P.O. Box 14350, Salem, Oregon 97309-504.

* Mr. Jay Woun, Oregon State Library, State Library Bldg., Salem, Oregon 97310.

∫ Ms. Tracy Rush, Washington Department of Natural Resources, Washington Natural Heritage Program, P.O. Box 47016, Olympia, Washington 95804-7016.

*Ms. Laura Scott, Washington Department of Transportation, Environmental Affairs Office, 310 Maple Park East, Mail Stop 47331, Olympia, Washington 95804-7331.

Tribes

*Mr. Rob Green, Confederated Tribes of the Grand Ronde, 9613 Grand Ronde Road, Grand Ronde, Oregon 97347.

*Fish & Wildlife Coordinator Kelly R. Doerksen, Confederated Tribes of the Grand Ronde, 47010 SW Hebo Road, Grand Ronde, Oregon 97347.

Academic Organizations & Societies

∫Dr. Ed Guerrant, Berry Botanic Garden, 11505 SW Summerville Ave., Portland, Oregon 97219.

*Kara Wippstock, Colorado State University - Documents Department, Libraries, Fort Collins, Colorado 80523-1019.

* Professor H. Paul Friesema, North West University, Institute for Policy Research, 2040 Sheridan Road, Evanston, Illinois 60208.

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President Barbara Hill, The Wildlife Society - Oregon Chapter, Bureau of Land Management, P.O. Box 2965, Portland, Oregon 97208.

*Ms. Mary Plank, Willamette University, English Department, 900 State Street, Salem, Oregon 97301.

Conservation Organizations

1000 Friends of Oregon, 534 SW Third, Portland, Oregon 97204.

Executive Director Dave Eshbaugh, National Audubon Society, Portland Chapter, 5151 NW Cornell Road, Portland, Oregon 97210.

* Kate Dwire, Native Plant Society of Oregon - State Committee, West Side Conservation, 429 SW 10th Street, Corvallis, Oregon 97333.

Oregon Environmental Council, 520 SW Sixth Ave., Suite 940, Portland, Oregon 97204.

Executive Director Marc Smiley, Oregon Natural Resources Council, 5825 N. Greeley Avenue, Portland, Oregon 97205.

Sierra Club - Oregon Chapter, 3701 SE Milwaukee Ave., Suite F, Portland, Oregon 97202.

*Dan Salzer, The Nature Conservancy- Oregon Field Office, 821 SE 14th Avenue, Portland, Oregon

* James Kagan, The Nature Conservancy- Oregon Natural Heritage Program, 821 SE 14th Avenue, Portland, Oregon

Industrial Organizations

*Burkland West Gulf Lumber, 5190 Chicago Street, Turner, Oregon 97392.

* Mr. Richard J. Mishaga, Senior Ecologist, CH2M Hill, 825 Multnomah Suite 1300, Portland, Oregon 97232.

*Ms. Candy Matsukado, David Evans and Associates, 2828 SW Corbett Avenue, Portland, Oregon 97201.
*Mr. Mark Brosseau, Environmental Impact Service, 101 W. River Road #200, Tucson, Arizona 85704.
*Mr. Ted Garh, Garh Farm, 186050 SW Masonville Road, McMinnville, Oregon 97128.
*Mr. Robert E. Preston, Jones & Stokes Associates, Inc., 2600 V Street Suite 100, Sacramento, California 95818-1914.
∫ General Manager John L. Harshman, McMinnville Water and Light, P.O. Box 638, McMinnville, Oregon 97128.
* Ms. Barbara D. Craig, Attorney at Law, Stoel Rives, 900 SW Fifth Avenue Suite 2300, Portland, Oregon 97204-1268.
* Ms. Susan N. Stafford, Attorney at Law, Stoel Rives, 900 SW Fifth Avenue Suite 2300, Portland, Oregon 97204-1268.
*Mr Dan Upton, Willamette Industries, P.O. Box 488, Dallas, Oregon 97338.

Interested Parties
*Ms. Nicole Coredan, 10015 SW Terwilliger Blvd., Portland, Oregon 97218.
*Mr. John Geddie, 8040 Bellamah Court NE, Albuquerque, New Mexico 87110.
*Ms. Judith Glad, 4967 SE 133rd Drive, Portland, Oregon 97236.
*Ms. Jeannette Hambry, P.O. Box 519, Hillsboro, Oregon 97123.
∫ Mr. Jim Hartnett, 17618 NW Springville Road, Portland, Oregon 07229.
*Mr. Wally Hurger, 55 Independence Circle #104, Chico, California 95973
*Mr. Jack Nicholls, P.O. Box 341, McMinnville, Oregon 97128
*Mr. Rick Spaulding, 1 East Anatamu Street, Santa Barbara, California 93101.
*Ms. Rachel Thomas, P.O. Box 4637, Huachuca City, Arizona 85616.

Private Land Owners
*Ms. Kathy Burbank, 190 SE Fir Villa Road, Dallas, Oregon 97338.
∫ Mr & Mrs. Jim & Irin Just, 39621 Almen Drive, Lebanon, Oregon 97355.
*Ms. Helen Singer, 39472 Miller Cemetery Road, Scio, Oregon 97394.
*Mr. Roy Stutzman, 39454 Shelburn Drive SE, Scio, Oregon 97374.
*Mr. & Mrs. Allen & Janice Treutle, 15415 Salt Creek Road, Dallas, Oregon 97338.
*Mr. Joseph Waibel, 134560 SW Hillsboro Highway, Hillsboro, Oregon 97123.

II. Summary of Comments:

Issue 1: One commenter suggested revising the definition of self-sustaining population which was defined as consisting of "a minimum of 1,000 flowering plants (consisting of at least 40 percent perfect-flowered), and evidence of seedling establishment and survival to be indicative of long-term population stability or growth." Based on annual monitoring of natural populations for over 10 years, the commenter estimated that the number of established plants necessary to meet the Draft Plan minimum requirements could be significantly greater than 1,000 and that number will vary from year to year. Because the number of plants flowering in any one year is estimated to vary between 20 and 50 percent. Of this reduced number that actually flower, fewer than 50 percent are perfect-flowered plants. Therefore, approximately 4,000 to 10,000 plants per population, on the average, would be necessary to meet the draft plan's definition of self-sustainability. The commenter's suggestion was that "self-sustaining" is undefinable, and the term "recovered population," would be better, defined as a population large enough to avoid genetic drift (500 individuals), and that remains at this size for 5 to 10 years. Furthermore, the recovery criteria should account for different ecological conditions in the Coast Range and Willamette Valley (see issue 2).

Response: The recovery objective definition of self-sustaining population for the reserve has been changed to reflect the recommendation: "In addition, for each subbasin, (a) Nelson's checker-mallow will have been protected in at least two reserves (preferably in different watersheds of the subbasin) with a minimum of 0.05 hectares (0.12 acres) of habitat occupied by Nelson's checker-mallow plants for each reserve, (b) the reserves are secure from the threats identified in the Reasons for Listing (p.10), (c) on average for any three consecutive years, at least 30 percent of the occupied habitat has reproductive plants,(d) there is evidence of seedling establishment and survival, and (e) the reserve population has been stable or increasing for a period of ten years. Based upon the above frequency data for Nelson's checker-mallow, a different definition of a stable population is necessary for the Coast Range and the Valley and Puget Trough. For the Coast Range, a stable population is defined for purposes of this recovery plan as one whose absolute drop in occupied habitat[7] is less than 33 percent during the ten-year period as determined by a monitoring program that has a 90 percent probability of detecting a drop of 33 percent in Nelson's checker-mallow occupied habitat while being able to tolerate a 10 percent probability of missing such a change if it does take place. For the Willamette Valley and Puget Trough reserves, a stable population is defined for purposes of this recovery plan as

[7] If the checker mallow occupies 500 square meters, a 33 percent drop would leave 335 square meters occupied by the plant.

one whose occupied habitat drops by less than 22 percent during the ten year period and will be determined by a monitoring program that has a 90 percent probability of detecting a 22 percent drop in occupied habitat with no more than a 10 percent probability of missing such a change if it does take place.

Issue 2: One commenter pointed out that the Draft Plan recognizes that Nelson's checker-mallow occurs in "two distinct ecological regions: the Northern Coast Range and Willamette Valley of Oregon." They pointed out that site-specific management actions were required by the Endangered Species Act and the Service should account for the distinct needs of separate ecosystem or recovery zones (a term used in the draft plan) occupied by a threatened or endangered species in a recovery plan.

Response: The narrative of tasks 1.6 and 1.7 stress that site specific management plans should be developed for each reserve based on the needs of that reserve. However, until task 1.2 is completed and the reserve sites selected, site specific management plans cannot be prepared. However, the step down outline was modified and the original single task to manage reserves was split into two objectives. Objective [Task?] 1.6 was to manage reserves in the Willamette Valley and Puget Trough. Objective 1.7 was to manage reserves in the Coast Range. The sub tasks of these objectives reflect the different nature of threats found in these two areas. In the Willamette Valley, the types of tasks needed for management included reducing threats from succession and controlling seed predation. In the Coast Range, the type of tasks identified for management included reducing threats from succession and controlling impacts from off highway vehicles.

Issue 3: One commenter pointed out that no scientific criteria were provided for selection of Nelson's checker-mallow recovery zones. Furthermore, the commenter stated that these could be based on legal and geographical features, because the biological and land use impacts within the Willamette Valley zone are relatively uniform. They believed that there should only be two distinct recovery zones. Another commenter argued that the number of reserves should be 20 with a minimum number of populations distributed appropriately among the recovery zones and he further recommended that Recovery Zone 4 be split into two zones: the two Washington populations being their own zone.

Response: The recovery zones were revised in the final plan and the boundaries of these zones were based on the hydrological water basin boundaries developed by the US Geological Survey. The hierarchial unit picked was the subbasin (4th Field HUCs) which are made up of individual watersheds (5th Field HUCS). Currently, Nelson's checker-mallow occurs in 9 of the subbasins so the number of recovery zones was increased from 5 to 9. Old recovery zone 4 consists of five subbasins, two in Washington and three in Oregon. In the draft plan a minimum of two reserves were to be established within each

recovery zone for a minimum of 10 reserves. The number of reserves within the subbasin was kept at two, but now the total number of reserves has been increased to 18.

Issue 4: One commenter pointed out that there should be a task to gather information about the extant Nelson's checker-mallow populations before the reserve sites were selected (old task 1.1).

Response: A new task was added that evaluates the status of all extant populations and will be accomplished before the reserve sites are selected.

Issue 5: Two commenters stated that the plan should protect all existing populations on public lands.

Response: Under task 1, a statement was included that calls for protecting populations on public lands ("Until the reserve sites are selected and recovery actions are in place, all populations on public lands should be protected to the maximum extent possible"). With the amount of occupied habitat required for each subbasin, probably more than two reserves will be needed to meet the subbasin goal. If each reserve contained only 0.05 hectare of occupied habitat, then a total of 6 reserves would be needed for that subbasin. Furthermore, by increasing the minimum number of recovery zones needed, at least 8 more populations will be protected under the new revised objectives.

Issue 6: The Confederated Tribes of the Grande Ronde Community of Oregon consulted with the Service with respect to the recent Secretarial Order regarding Federal-Tribal trust responsibilities and the Endangered Species Act, the Tribe's relationship with the Service, and how this relationship bears on the Recovery Plan. The Tribe has made a commitment to the preservation of Nelson's checker-mallow on its lands. To this end, the tribe intends to further develop and implement management plans to protect the plant on its properties. The Tribe proposed language for the plan intended to assure the Tribe of flexibility in long-range planning for the plant, while providing certainty for the Tribe about its responsibilities under the Recovery Plan. The Tribe wanted to ensure that its responsibilities under the Recovery Plan are fair and proportionate to the management of Nelson's checker-mallow in the entire Yamhill subbasin.

Response: The Tribe is under no obligation to participate in recovery of this plant on Tribal lands. The Tribe's voluntary participation is outlined in language proposed by the Tribe and incorporated in the sections on "the Yamhill subbasin" on page and "select reserve sites" on page 26.

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